I CHANGE WEATHER

FLYING

THE WORLD'S MOST WIDELY READ AVIATION MAGAZINE

MAY, 1956
35 CENTS
In U. S. and Canada

TRENDS IN AIR TRANSPORT
By Donald W. Douglas, Jr.

★

French Scientist's Flying Disc:
THE COANDA STORY

AIR INDUSTRY TEAM:
DONALD W. DOUGLAS, JR. AND SR.

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How to spot a member of Aviation's **First Team** -

You touch down : Then you make a taxi beeline for this sign.

PAGES

original equipment by the builders of America's most popular aircraft.

means he is part of the most reputable dealer-distributor organization in the land, established to serve – and serve well and squarely–the needs of America's ever-growing civil air fleet.

means he carries a complete line of top-quality aircraft parts and accessories.

means he can handle the job – small part or complete overhaul.

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MAY, 1956 VOLUME 58, NUMBER 5

FLYING

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THE COVER: Donald W. Douglas, Jr., whose article, "Trends in Air Transport" appears on page 28, with his father, Donald W. Douglas, Sr., president of Douglas Aircraft Company.

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MAILBOX

THE AIRMAN'S WORLD

While eagerly reading the February issue of FLYING I was very disappointed that there was no "Airman's World." After reading this feature in the December and January issues, I was hoping that it was to become a monthly feature. The "Airman's World" is written with some of the most beautiful phrases I have ever read and most certainly expresses the airman's love for the air and flying. Please let's have more of these features. I'd like to make a scrapbook of them.

FRANCES SLOAN

Belle Glade, Fla.

● *Somewhat hesitantly we ventured to publish in* FLYING *some excerpts of a book we are preparing under the title of "The Airman's World." If these excerpts are enjoyable to the readers of* FLYING, *we shall be happy to include them in each issue for some time to come.*—ED.

STRICTLY FROM THE BIRDS

Congratulations to Dr. August Raspet on his much needed, and long overdue to aviation, study of birds and their flying characteristics, as described by Lydel Sims in his article in your March issue.

I believe that the findings of his work may easily parallel the vast amount of research being conducted by wind tunnels and aeronautical laboratories throughout the world.

HENRY W. BORBRIDGE

Berkeley, Calif.

NATIONAL FLYING CLUB

. . . Your editorials are a constant source of inspiration. It is a good feeling to know that at least one of the national leaders in aviation can see the problems and trends of private flying.

JAMES A. ROSS, JR.
CAPT., SIGNAL CORPS

Urbana, Ill.

● *Our readers will recall Captain Ross as the author of letters in the* MAILBOX *of* FLYING *which have initiated formation of a national flying club. Captain Ross reports that progress is slow but that the next few months will see the official birth of the organization.*—ED.

MAGAZINE SWAP SHOP

Thank you for publishing my letter in the March issue of FLYING offering back issues of aviation magazines. The response has been tremendous and my only regret is that I will not have enough magazines to fill the demand.

Although I have received many offers of cash, including one just received today saying that the writer would pay two dollars for one particular issue, I have extended this offer only to flying clubs and groups who need only pay shipping charges. Actually the knowledge that groups of individuals will be enjoying these magazines as much as I have will be sufficient profit for me.

I would like to know if we could work something out whereby clubs could exchange surplus publications. I would be very happy to assist in such a program for the only cost to me would be a few cents for a stamp now and then where someone forgot to enclose a stamped envelope.

JAMES O. POWELL

Newburg, Pa.

GENERAL PERSHING'S DODGE

In the March issue of FLYING is an article by Mr. D. C. Fox (A Flying Air Force Is Born) which we find very interesting.

The photograph in which General Pershing stands at the right, reveals a 1916 Dodge. Last year the Dodge Motor Company presented the Ordnance Corps with a 1916 Dodge which they claimed to be the one used by Pershing during the Campaign with which your story deals. We have this car in the Museum.

G. B. JARRET, CHIEF
TECH. INFORMATION DIV.
ORDNANCE CORPS

Aberdeen, Md.

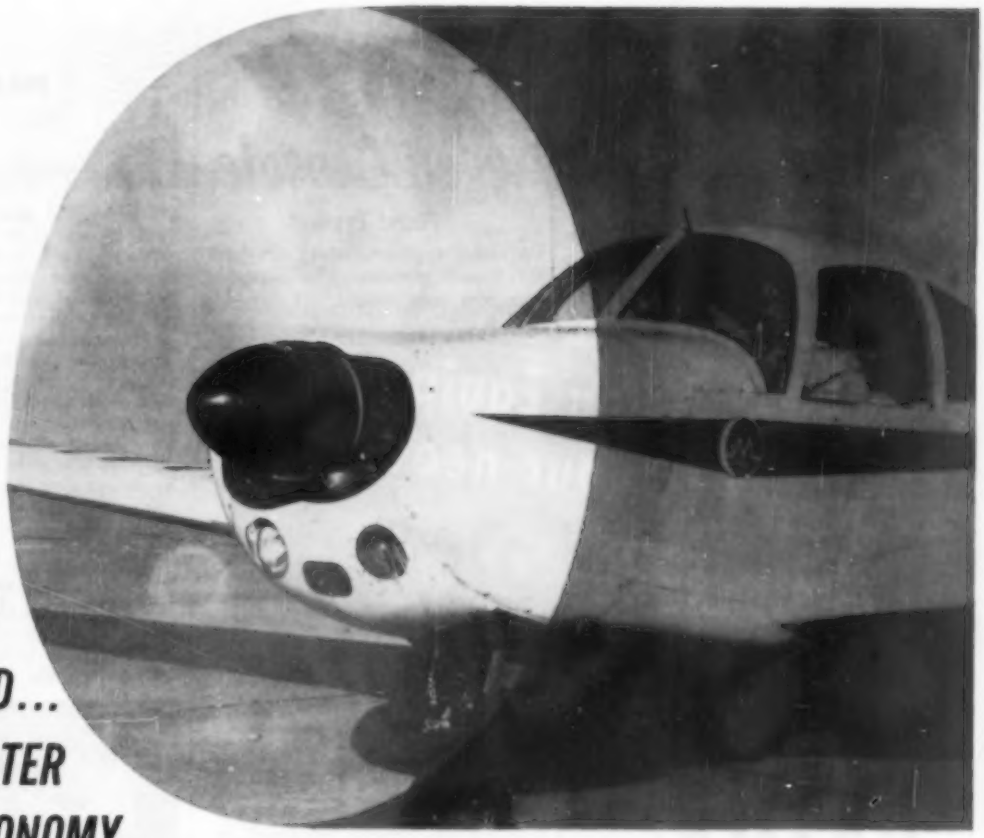
PRO'S NEST

. . . Mr. Hoyt says in the February issue's "Pro's Nest" that if a pilot is undershooting the runway "just raise the flaps a few degrees." With all due respect to Mr. Hoyt, I can think of a lot of easier ways to commit suicide.

(Continued on page 8)

more
m.p.h.
per h.p.
in the
Mooney
Mark 20.

GREATER SPEED... GREATER ECONOMY



The amazing Mooney Mark 20 cruises at 165 m.p.h. and is powered by the famous 150 h.p. Lycoming engine. This extra-speed means a quick trip for you, regardless of destination — across the state or across the nation.

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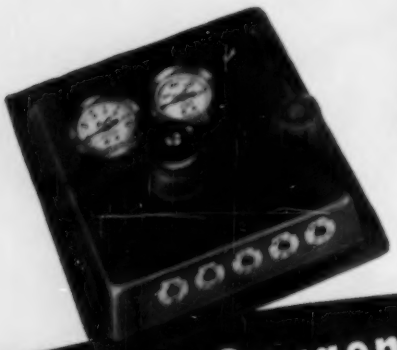

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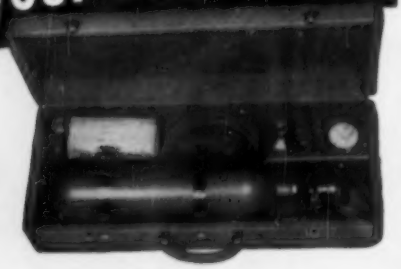
Provides supplementary oxygen for 1 to 5 persons. The dependable low cost system.

Which Oxygen Equipment best fits your needs?



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Scott supplementary oxygen systems permit flight at higher altitudes with resultant savings in time and fuel. Pilot and passengers alike arrive at destination fresher, more alert and free from altitude fatigue which affects many people at altitudes as low as 5000 feet. Scott also manufactures larger capacity systems for corporate owned aircraft and airliners. Write for complete information or contact nearest distributor listed below:

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Piedmont Aviation, Inc., Winston-Salem, N.C.
Salt Lake Aircraft Parts, Salt Lake City 16, Utah
Sky Store, Hawthorne, California
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Washington Aircraft & Transport Corp., Seattle 8, Wash.
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MAILBOX

(Continued from page 6)

I agree that passenger comfort is important, but it is secondary to flying safety. I don't care what airspeed you have on final, this is a dangerous procedure and I violently disagree with it.

If a pilot perceives that he is going to be short, in heaven's name put the power on but leave the flaps alone! I think it's a shame to safely accomplish a mission, be it a cross-country trip or a local flight, and then stack up on the final approach. Your passengers would soon get over a burst of power on final, but they might never get over a crash.

LT. HOMER A. GAOUETTE
Abilene AFB, Tex.

BIG OR LITTLE?

Would appreciate clarification of placement of aircraft identification numbers. The old style places number on upper left, lower right wing and both sides of

tail. The new style has them on each side of the aircraft body.

In your February "Briefings" you state that the new rule to put large identification numbers on the sides of aircraft has been withdrawn. Would kindly appreciate the facts concerning same.

WILLIAM A. RICE
Pacomia, Calif.

● *To our chagrin our statement in February* FLYING *is not exactly accurate. We are now informed that the Civil Aeronautics Board withdrew its proposal to make the large numbers* mandatory, *and issued a revised regulation which now permits use of either type of number at your option—the new large ones on the fuselage, or the standard ones on the wing and tail.*—ED.

ROYAL NETHERLANDS GOC

As a regular reader of your very fine aviation magazine, I have read from time to time about the U. S. Ground Observer Corps. I am an instructor with the GOC of the Royal Netherlands Air Force. I should like to correspond with any of your readers with this common interest and also would like to exchange aircraft photographs.

GILBERT MULDER
AVIATION JOURNALIST
P. O. Box 8
Kortenhoef, Holland.

...the *Bellairus*

for the executive who's going places!

Bell Aircraft Corporation's newest helicopter... the Model 47H BELLAIRUS... answers today's need for fast, dependable, ultra-safe transportation.

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Equipped with floats, the BELLAIRUS makes a round trip from an office building to a field location to an off-shore installation without the necessity of changing vehicles.

Let us tell you why... a Bell helicopter can be an important asset to the *executive who's in a hurry to go places.*

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Over 150 m.p.h. speed, "hush-that makes flying like driving

It's the latest and greatest in single-engine business airplanes. For no other can match the combination of speed, comfort and ease of flying which this new Cessna 182 offers!

Land-O-Matic makes the big difference . . . makes flying like driving. You drive straight down the runway and up in the air. No need to stall or "drop in" when you land—you drive right down. And it turns in a shorter radius . . . is easier to park than a car. You drive around on the ground!

You get this, plus all-round performance that measures up to airplanes costing thousands of dollars more—new "hush-flight" cabin quietness that makes long trips a pleasure—new luxury and style throughout. Plenty of room for four big people. Drive the 182 soon. Only $13,750 f.o.b. Wichita. See your Cessna dealer today (listed in the Yellow Pages of your phone book) or write to CESSNA AIRCRAFT CO., Dept. F-6, Wichita, Kansas.

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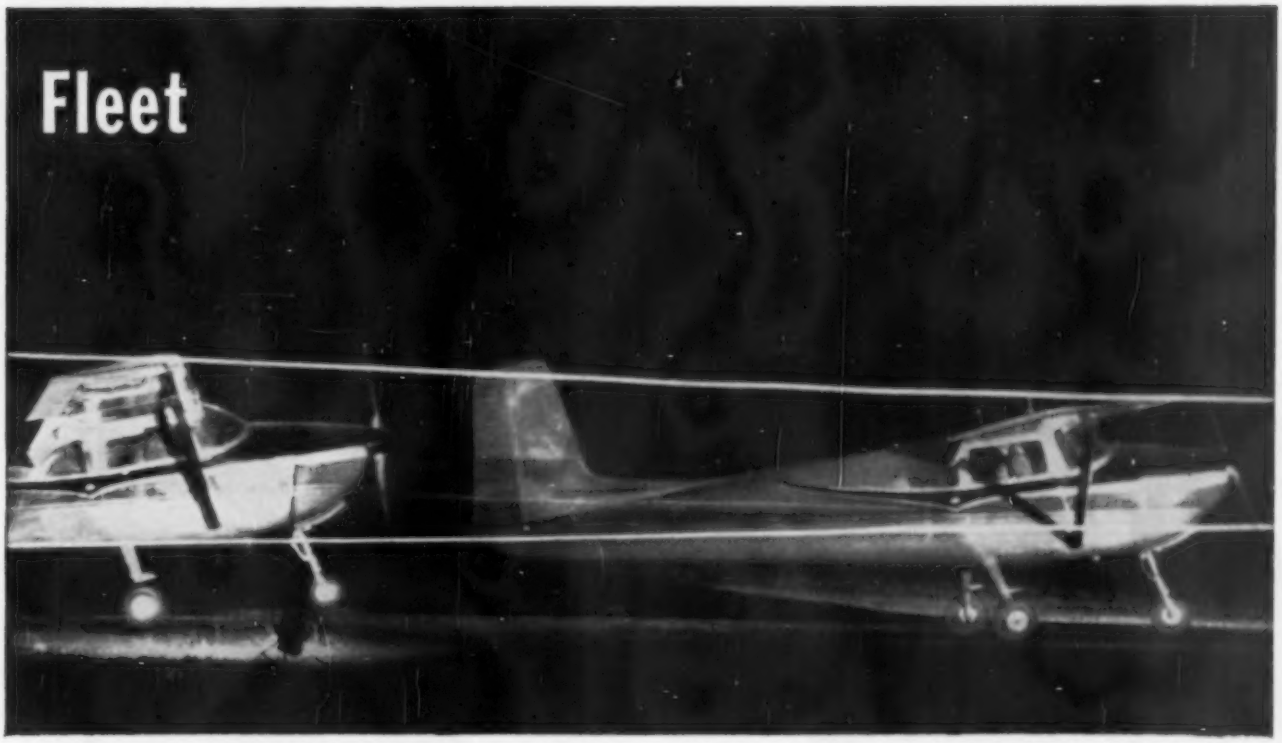
Fleet



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flight" comfort and the feature ...all in the new Cessna 182!

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180 Fast, 4-place business airplane. Top seller in over 150 m.p.h. class. New "hush-flight" features—2-tone striping. A great "float plane," too. $12,950 f.o.b. Wichita.

182 Greatest single-engine business plane. Land-O-Matic landing gear. Performance of airplanes costing much more. "Hush-flight" cabin. $13,750 f.o.b. Wichita.

310 "Tomorrow's Twin Today"...years ahead in design, engineering. Safety proved by performance of more than 300 now in regular use. $54,950 f.o.b. Wichita.

Briefings . . .

TO ENHANCE ACROSS-THE-BORDER private flying the Canadian Travel Bureau now has these two helpful pamphlets available for prospective visitors. "Admission of Aircraft to Canada" contains pilot information and regulations governing the aircraft. To pair with this is "How To Enter Canada", a summary of regulations affecting the individual visitor. Pamphlets may be obtained at the Bureau branch offices or headquarters, Ottawa, Ontario.

AN ANALYSIS OF BUSINESS FLYING for the year 1954 shows that, while many businessmen pilot their own single-engine planes, those who use multi-engine aircraft usually depend on hired professional pilots. Out of 16,480 single-engine aircraft used primarily for business, only 1,720 were flown by hired pilots. In contrast 1,760 of the 2,080 multi-engine planes used for this purpose were piloted by hired "pros."

IN A PROPOSED nation-wide network of distributors for its *Riley Twin* executive aircraft, Temco, manufacturer of this twin-engine conversion of the *Navion*, has selected White Rock Aviation Inc., Dallas, Tex., as its first distributor. White Rock's territory is to encompass Dallas and the North Texas area according to F. C. Merrill, commercial sales manager for Temco, shown here with the *Riley Twin*.

RECENT BRITISH FLIGHT TESTS show that the trailing wingtip vortices of jet-driven aircraft, rather than the wake of the jet engine itself, pose the greatest danger to light planes. The tests brought out also that similar dangers exist from wingtip vortices of large airliners, especially when flying at low speed, such as during landing approaches. Light plane pilots are warned to maintain safe distances and to cross the wakes of these airplanes above or below their level.

THE BABB COMPANY, INC., with headquarters in Phoenix, Ariz., has acquired the entire engine overhaul facilities of Pacific Airmotive Corp. at Linden, N. J. Babb is transferring its present operation at Newark to the Linden property. The combined operation will now become the company's Atlantic Coast and European overhaul service base.

A FLYING CENTENARIAN, John B. Cooksey of Wichita, Kan., celebrated his 102nd birthday anniversary by spending 20 minutes of it in an airplane flight with Vern Carstens as his pilot and as a guest of Beech Aircraft. This jovial Kansan started the practice of taking an annual plane ride when he was only 95 years young.

PAN AERO FLYING CLUB of Panorama City, Calif. finished off a record year of safety and flying achievement by winning the Hughes National Aviation Safety Trophy for 1955, the California Aeronautics Commission's Perpetual Trophy and a late model radio transmitter and receiver set, an additional award by Lear Radio. In over 800 accident-free hours of instruction, the club produced 23 private and two commercial pilots, two flight engineers, one A & E, one ground instructor and 59 solo students.

BREAKING AN ELECTRIC light bulb, suspended on an extension cord, caused an explosion and $100,000 in airplanes and equipment went up in flames at Canastota, N. Y. Gasoline was ignited by sparks from the bulb, resulting in a flash fire which spread rapidly through the hangar.

INSTRUMENT PILOT SHORTHAND, CAA's valuable quick reference compilation, in pamphlet form, of symbols and contractions most frequently used in ATC clearances is available in revised (1955) edition. Primarily prepared for use in instrument flight courses, it is of equal value to the individual pilot. Ross School of Aviation, Municipal Airport, Tulsa, Okla. offers the pamphlet free to those who request it.

A BUY-AS-YOU-FLY retail financing plan, for new and used aircraft, has been inaugurated by Beech Aircraft. It works like automobile financing — the buyer makes a down payment, takes his plane, and pays it off in convenient monthly installments. Insurance and finance charges are included in the package and at interest rates 2 per cent lower than the normal rate for automobile financing. New planes are financed over a 36 months period; used planes up to 24 months.

THE FIRST TWIN ENGINE turbo-prop aircraft to be assigned to the Air Force are these Convair YC-131C's, forerunners of the "work horses" which will be employed by MATS in its future transport missions. Exhaustive testing by MATS personnel preceded acceptance. Powered by Allison YT-56 turbine power plants and equipped with Aeroproducts propellers, the cruising speed of the YC-131C is quoted at more than 320 mph.

SUITABLE FREQUENCY in the aeronautical band for air-to-ground telephone communications is being asked of the Federal Communications Commission by the National Association of State Aviation Officials. Reason for the request is a growing need for pilot information on ground transportation, airport service, hotel accommodations, etc., due to increase in executive flying. Messages in this category are not permissible over present CAA set-up.

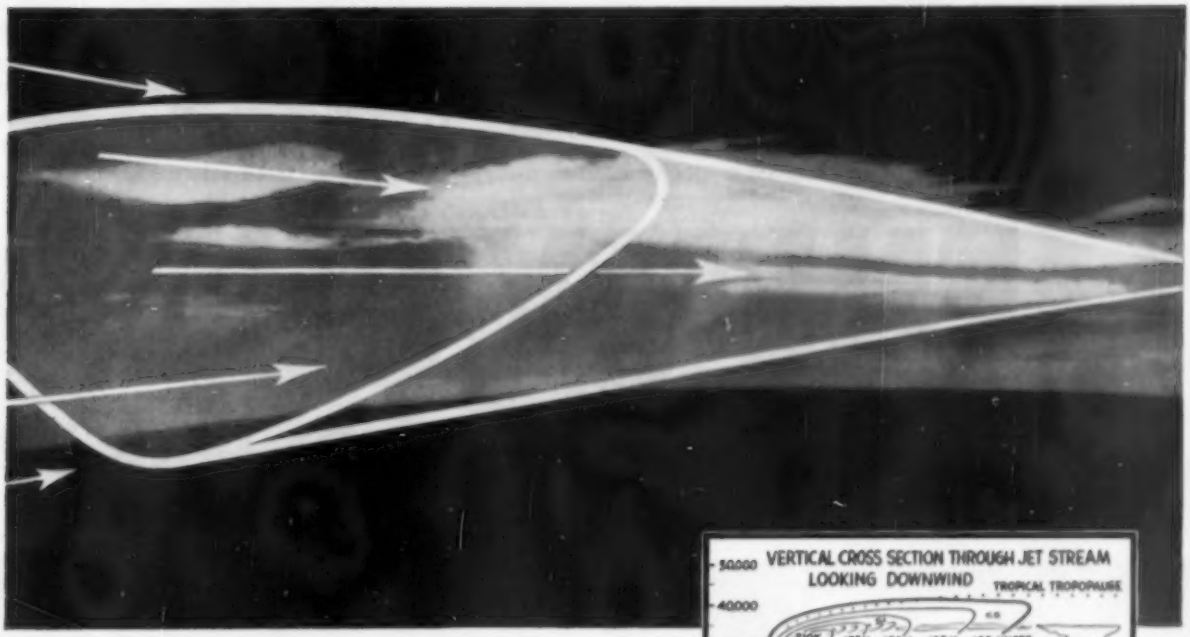
DEVELOPMENT of an entirely new all-purpose airplane wash, which sudses well, rinses easily and does not dull plane surfaces is being introduced to the market by Permatex. A compound of synthetic detergents, it will function in hot or cold water.

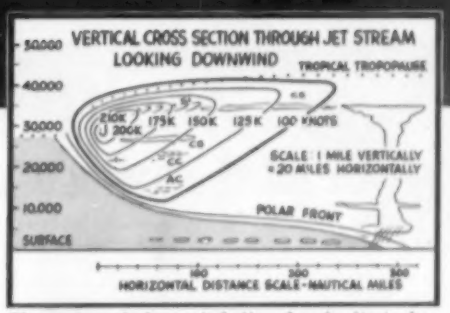
POSING BEFORE A BACKGROUND of the latest Beech and Piper aircraft models, beauteous fashion models, displaying complete

(Continued on page 82)

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau





Clear air turbulence is believed to be limited to left-hand edge and top of jet stream. Rapid changes in temperature (10°F. or more in 1° latitude) occur on colder left side.

JET AGE DEVELOPMENTS

JET FLIGHT — As jet flight becomes more commonplace, it's increasingly important to understand and recognize the problems and phenomena associated with high altitude, high-speed travel. Clear air turbulence, sudden wind and temperature changes, subsiding air are some of the meteorological features now being explored.

JET STREAM—A recently discovered current of high-speed winds moves from the West across the middle latitudes of both hemispheres. Maximum wind velocities of over 200 knots are reached at altitudes of 35,000 to 40,000 ft., varying as much as 15 knots per 1,000 ft. up to the core. Cross-sectional view at upper right best shows jet stream structure.

JET FUELS — To meet the critical demands of substratosphere flights, jet fuels must also act as cooling agent. New manufacturing procedures developed by Socony Mobil can produce jet fuels with improved thermal stability to meet these critical requirements.

First fueling of turboprop airliners to go into commercial service in U.S.A. is being handled by Socony Mobil. The customer is Trans-Canada Air Line's Viscount Fleet.

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ENEMY SUBS!

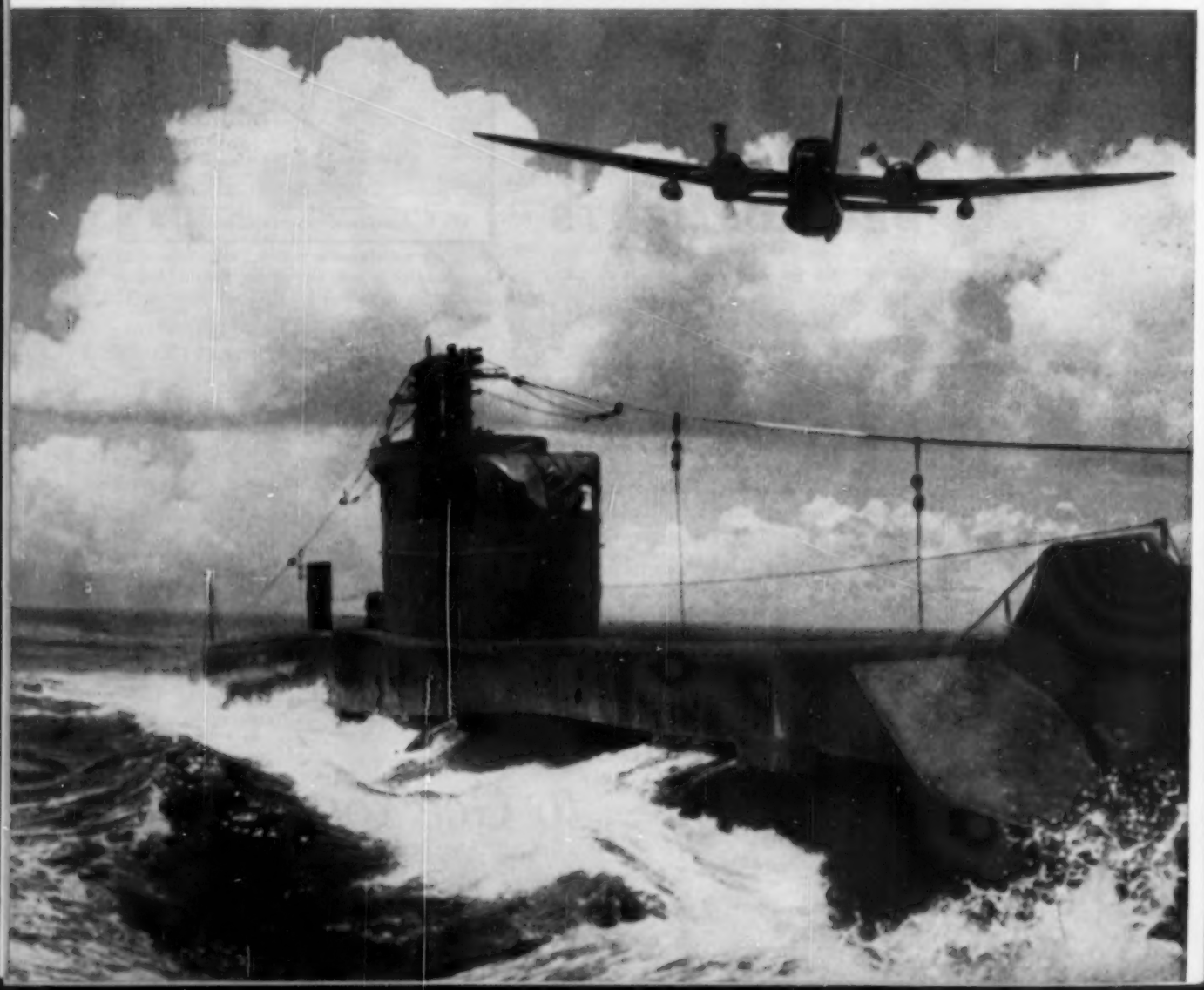
A CRUCIAL U.S. DEFENSE PROBLEM

Over one-fourth of the people in the U.S. live within range of atomic missiles that could be launched in a sneak attack by

Modern submarines, able to make long voyages while completely submerged, and to launch nuclear missiles in a sneak attack, are among the most sinister weapons of this atomic age.

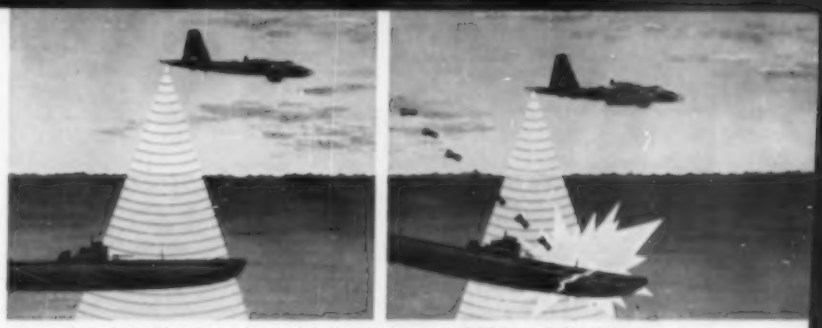
To safeguard our nearly twelve thousand miles of coastline against sub invaders, the U.S. Navy for ten years has patrolled immense areas of the ocean, in fair weather and foul, in Lockheed P2V *Neptunes*. Special submarine detection gear enables the P2V, despite darkness or fog, to pinpoint even submerged subs. And pro-

Official R.A.A.F. photo (below) shows war games "attack" on British sub by Royal Australian Air Force *Neptune*. (P2V's are in military service for the following friendly countries: Australia, Canada, Great Britain, France, Japan and the Netherlands.)



gressive modifications of the P2V have kept it militarily up to date at lowest cost to the Navy. Pound for pound, and dollar for dollar, the P2V *Neptune* is the most formidable patrol aircraft bearing the insignia of the U.S. Navy.

Recently the Navy awarded Lockheed its *24th* contract for P2V *Neptunes*—a tribute to Lockheed's leadership in weapons system management, the development and application of electronics, and the design and production of long-range patrol aircraft.



These drawings illustrate the multiple-mission capabilities of the P2V *Neptune:* **1** Low-flying P2V's electronic gear spots submerged sub because its presence distorts the earth's magnetic field. **2** Depth-bombing a submerged sub, **3** torpedoing a surface ship or laying mines to disrupt enemy shipping are jobs the P2V can do equally well. **4** Spotting hurricanes and reporting their velocity and direction are routine but important P2V missions which save human lives and vast sums in property damage.

Lockheed Missile Research Laboratories to Be Built in Stanford's Industrial Park

A series of research laboratories will be constructed by Lockheed's Missile Systems Division on a 22-acre site adjacent to Stanford University, Palo Alto, California. On a nearby site of 275 acres, at Sunnyvale, Lockheed will build extensive new engineering, manufacturing and administration facilities. Lockheed's 3,000 scientists, engineers and technicians now developing guided missiles and unmanned aircraft at Van Nuys will transfer to Palo Alto and Sunnyvale as rapidly as construction permits.

The proximity of both new sites to Stanford will make the university's outstanding academic resources available to Lockheed research teams. And the new laboratory facilities to be built by Lockheed will provide Stanford scientists with technological tools and consulting opportunities hitherto unavailable.

ATTENTION, STUDENTS WHO DESIRE MASTER OF SCIENCE DEGREES: Lockheed's Advanced Study Program *helps students achieve MS degrees in Mathematics, Electrical and Mechanical Engineering, Aeronautics and other physical sciences. Write:* LOCKHEED MISSILE SYSTEMS DIVISION, *Van Nuys, Calif.* *(Below: aerial photo of Stanford campus.)*

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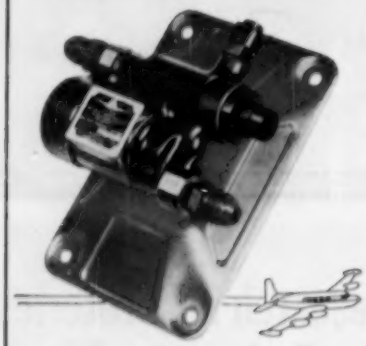

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HANGAR FLYING

TRAPPED

A COUPLE OF YEARS AGO, my friend Don and I were flying over King Salmon Airport on the Alaska Peninsula; we had been up the Savanowski River in a float-equipped Cessna 180 trying to get pictures of the brown bears, quite a job

from a flying plane. Both of us had done most of our flying in the Rockies, so the Alaskan terrain did not worry us, but this was our first float experience—total time on floats about 35 hours out of Seattle.

We had been at King Salmon the night before so wanted to stop somewhere else this time. A call to the tower told us that there were good gassing facilities at Dillingham on the north side of Bristol Bay, a short hour from King Salmon.

Dillingham appeared on schedule, one of the numerous cannery towns. The trouble was that the alleged gas float was a dock, high and dry at low tide, and that the strong south wind made any landing on the Bay out of the question.

Fuel was essential soon, so we started searching for a lagoon back of town where perhaps seaplanes were based to avoid rough water. Sure enough, there was one, with three Aeroncas on it.

The pond looked awfully small. Don nearly dragged the floats on the tundra bringing her in, to the south. Tracks through the grass to the north made us wonder. We were really bothered when, after landing into about a 15 mph wind, three-fourths of the lagoon was used up before we stopped.

There was a dock, of sorts, to one side where a fellow swung us in. He said he had lots of gas, but acted rather unhappy. After considerable talk, it came out that, as the local operator, he used this small lagoon only for safe storage of his Aeroncas. He always took them off empty, to fuel and load on Bristol Bay when he had a trip. He admitted that the tracks to the north had been made by float-planes which, when they had run out of water, had bumped along over the tundra until airborne.

Things looked grim. We completely unloaded the aircraft. The local operator very kindly offered to transfer the gear and gasoline about five miles over to the Nyakuk River, where he advised me to land and taxi as far as "reasonable" up on the mud floats, if I was able to take off successfully.

It was not good. I had a short 800 feet of water for takeoff; to the south there was a ten-foot rise at the edge of the lagoon and no tundra to bump over. This was up to me, as owner.

There was nothing to do but give 'er the gun. Half the pond had gone before the ship was on the step. I held her there until just before hitting the bank on the south side. A desperate yank on the wheel and we were flying. I had caught a glance at the airspeed at takeoff out of the corner of my eye; it was 42 mph!

So I landed on the Nyakuk River and taxied up on the mud bank. Proceeding several hundred yards over the mud to where a Bellanca on floats was parked was another new experience. Soon the pickup appeared, with our gear, gas, Don, and the local operator. Three hours of tough stevedoring down the bank and across the mud to gas and load the plane, seemed almost pleasant.

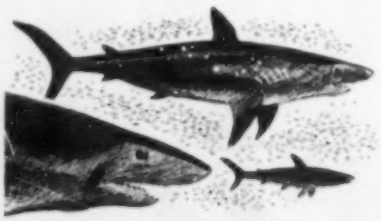
In piling up 85 float-plane hours looking over Alaska, the Northwest Territory, and the Yukon, we had no other trouble. We made it a practice to carefully size up all restricted landing spots from our own view-point, and did not rely on what others may have appeared to do.

HORACE H. KOESSLER

Missoula, Mont.

SHARK BAIT

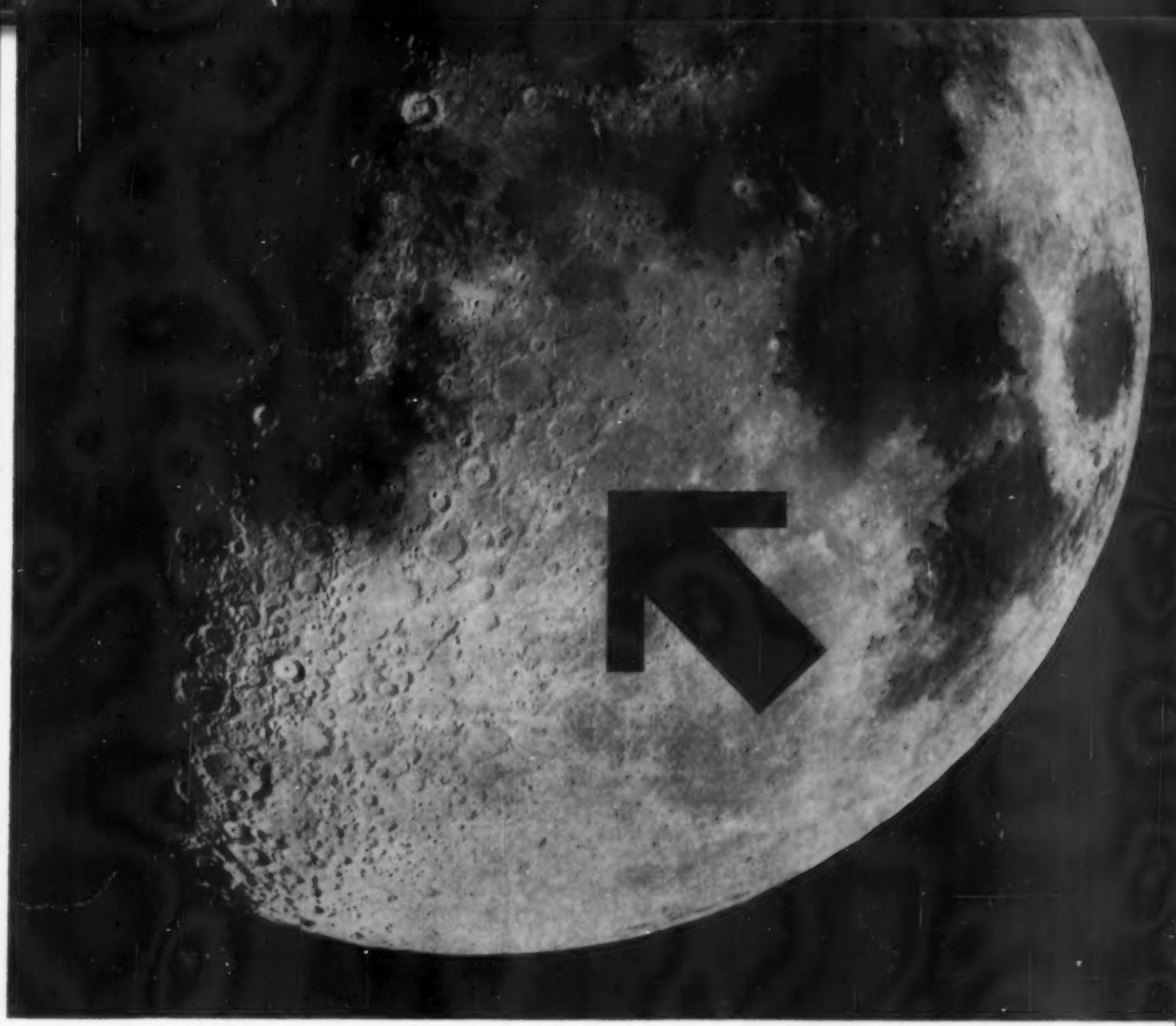
FEW PEOPLE CAN CLAIM to have been saved by man-eating sharks, least of all in Australia. If you mention being in an aeroplane at the time, you're on the receiving end of a queer look. My side-



kick and I were shark fishing near an old training 'drome built during the war. It was abandoned except for six men kept busy burning old aircraft—just two a day. If they burned the lot at once, they would be out of work.

My mate, an ex-fighter-pilot thought this burning a wicked waste of aircraft, so went to the 'drome one day dressed in his old officer's uniform. When he

(Continued on page 18)



NEW FRONTIER

"If we had to put a man on the moon, we could do it."
—Overheard at an Institute of Aeronautical Sciences luncheon

This impromptu statement was not a matter of idle conjecture. It was a statement of a positive and scientific fact – as provable as if he'd said the Aleutian Islands – and contingent only upon three prime requisites: enough time, money, and necessity. And by "we" he meant today's mindpower and facilities operating under the most advanced concepts of research and development.

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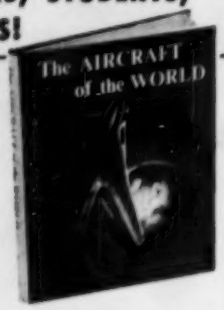

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HANGAR FLYING

(Continued from page 16)

returned that night, he informed me we were to become the owners of a *Tiger Moth*. Most of the planes were in first class order, except for instruments which had been salvaged and sent back to supply. He had told the sergeant in charge that he had orders to pick up a *Tiger Moth*, and to have one ready for him in three days. It didn't matter about the instruments.

Three days later I was present to see him land the *Moth* in his father's back paddock, several hundred miles away. She was all ours, shining brightly in a fresh coat of training yellow. The airforce would never miss her; or if they did, would not know what happened to her. We could never register her officially so did it ourselves—great black letters that read VH-IXL. The VH was okay; all Australian planes carried that bit. The IXL came off a jam tin label.

The plane was a great help with the shark fishing. We could scout the sea for miles around and, if no sharks were present, we spent the day ashore. The beach was as good a 'drome as any.

Time came when we thought to fly up and have a look at the big city. Just after we took off, an overcast developed quite unlike anything I had ever seen before. The weather boys later described conditions that day as, "An unusual tropical disturbance."

My mate was worried for he kept climbing the *Tiger* higher and higher. We entered the front high but not high enough to get above it. At first it was just mist and a few drops of rain on the windshield; then a tropical downpour centered itself above the cockpit. We wallowed like a ship at sea. So much rain poured in that I thought we were in danger of sinking. The plane finally fell into a spin, and I was too sick to care. When we broke clear under heavy overcast, we were out over the Pacific. Visibility was down to a couple of miles. Where was the shore—left or right of us; or were we flying away from it? North, east, south or west, we had four chances and three of them would lead us on till we ran out of petrol. The empty instrument panel yawned like a spinning skull. It was time for the sun to set but there was no sun.

We would cruise in circles where we were for a couple of hours, then go down in the drink; or charge off in some direction or other and hope for the best.

I looked over the side and, in the long greasy swell below, saw the dark forms of sharks as they went swimming by. Some sixth sense always seemed to draw them to the scene of a free feed. They were swimming away from us, but the significance didn't dawn on me till some minutes later. Many times while shark fishing I had noted that sharks always came into shore about nightfall to eat. We brought the plane round and chased those sharks. And as darkness finally fell, we saw the lights of Coolongatta down the coast.

ADRIAN BRYANT

Vancouver, B. C. Canada

THEY MEAN WELL

WHILE SITTING AT HOME the other night wondering just how stink-o the weather really was, I tuned in the Cleveland range station just in time to get the local weather and the end of the broadcast "note" which I am sure you have heard them use recently. This is what I heard:

". . . Ceiling 100 feet, visibility 1/16th mile, fog, smoke, and light snow. Temperature 32 degrees, dew point 32 degrees, wind east 3 miles per hour, glide path and ILS closed down for service. . . . Keep alert and watch for other traffic."

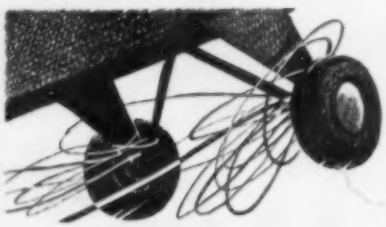
H. M. LOVE

North Olmstead, O.

WIRED FOR PATTERN

DURING 1:45 OF FLIGHT time in the Grand Duchy of Luxembourg, I landed at every airport in that pint-size prototype of Graustark.

One field was a 1,000 foot corduroy grass strip at Esch. Landing, you graze



apartment houses and power lines. Taking off, you bank as your wheels leave the ground, to skirt an old slag heap square in the middle of the runway. Then, after being tossed by hot air from blast furnaces at the end of the field, you bank sharp left to avoid crossing into France.

The other field, four miles north of the city, is a good paved strip flanked by a grass area for use by the country's ten or so lightplanes.

After finishing work one night at our office in Luxembourg City, I bicycled out to the latter field. In my pocket was a Luxembourg flight permit (the first issued to an American, they told me), and a US log book with 42 hours therein. Since this time was on Cessna's, the prewar Aeronca I rented for 12 cents a minute added a few dashes of the unknown.

The whole country, plus parts of France, Germany and Belgium could be seen from 3000 feet. I flew around the city to view the still-standing battlements and precipitous topography that had made Luxembourg one of the most important fortresses of the medieval world. Then I flew out over Hollenfels Castle, perched above a little gorge, with crossbow slits in its ancient gray walls and surmounted by a high round tower.

After leaving the castle and practicing

(Continued on page 68)

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FLYING
VOLUME 58, NO. 5
MAY, 1956

AN EDITORIAL

We Must Fly to Freedom

FROM our national population of some 165 million, more than 38 million attend schools of one kind or another. The education bill exceeds 10 billion dollars. In June about 700,000 boys will graduate from high school and another 200,000 from college.

Yet despite this vast educational program, aviation in the United States is starving for technical manpower.

During this same time the United States and Soviet Russia are in a life and death struggle for air and space supremacy. No one denies that defeat in this struggle will cost the free world its sovereign existence. Furthermore there is abundant evidence that time is of the essence.

Why does the starvation for technically trained youth persist in face of the continuous national struggle for aviation supremacy?

The cause is not hard to find. For a shameful ten years the American boy has been grounded—unmotivated and uneducated to the air age—the equivalent in historic outlook of having his eyes put out. It is only a matter of time until this blindness will give the slave governments of the world victory by default.

Somehow then we must get the American boy motivated toward aviation while he is still a boy. Later is too late. And one fundamental of this motivation is to get him into the air.

The first editorial I wrote after becoming editor and publisher of FLYING in March, 1952, was a notation that American aviation had lost the boy. The end result would be to dry up our sources of technical and engineering manpower, cripple our research and development, depopulate our civil and military cockpits, stalemate our air traffic control, decimate our community airports and pauperize our national security of knowledgeable recruits.

Frankly I had hoped that one or other of our great private foundations would mark the disparity between our struggle for survival and our lack of motivation to air technology and would throw its weight into the breech. I even hoped that some rugged individualist would make a gallant gesture in behalf of the nation by gambling that eventually he could break even on the mass production of a cheap trainer for the American boy. I'm sure there are such men who would move into action if they had knowledge that in this way they could strike a strategic blow for their way of life.

But no such hope to save the situation by the vision of private enterprise has matured—and our urgency has become vast. Let's look at a few of the results which stem from our loss of motivation for the boy.

We have numbers of the world's best fighter planes sitting around with nobody to fly them.

We turn back to civil life an inordinate percentage of technical trainees because they haven't got the stuff of which airmen are made.

Our college output of air engineers and related scientists has halved in ten years, and the Soviet output of comparable talent is now more than double our own.

Our aircraft companies are forced into fierce competition for the trickle of technical brains flowing from our campuses. Their advertising bill for skilled help, wooed from direct competitors or other industry, is a stupendous item in airpower production.

In both civil air commerce and military airmanship, we are living off the fat of personnel generated by World War II.

Our public demand for civil air transportation is fast reaching the point where the problem is not to provide it but to control it.

Our civil flight training schools have practically disappeared; our student pilots number a mere fragment of their former enrollees; our training types of civil aircraft are gone from the production lines; and our community fields are as barren of youth as an old ladies' home.

Isolated groups and movements struggle valiantly against these circumstances—the National Aviation Education Council; the Cadet and Aviation Workshops of the CAP; an occasional high school or grade school with foresighted leadership. But all together they barely scratch the surface. The problem is bigger and more urgent than they can cope with.

Frankly I do not think the situation can be dealt with by college scholarships alone, even though the aviation industry were to go into that phase of it wholesale. Nor do I think it can be wholly solved by teacher training, although that too is an essential part. Probably television with its visual aids could be highly effective and a national movement should explore the subject. But fundamentally the best motivation would be to get the boy into the air on a national scale and any plan which neglects that phase can not succeed.

Either that boy goes into the air or the future of this country goes down the drain. We must fly to freedom.

Gill Robb Wilson

Gill Robb Wilson
Editor and Publisher

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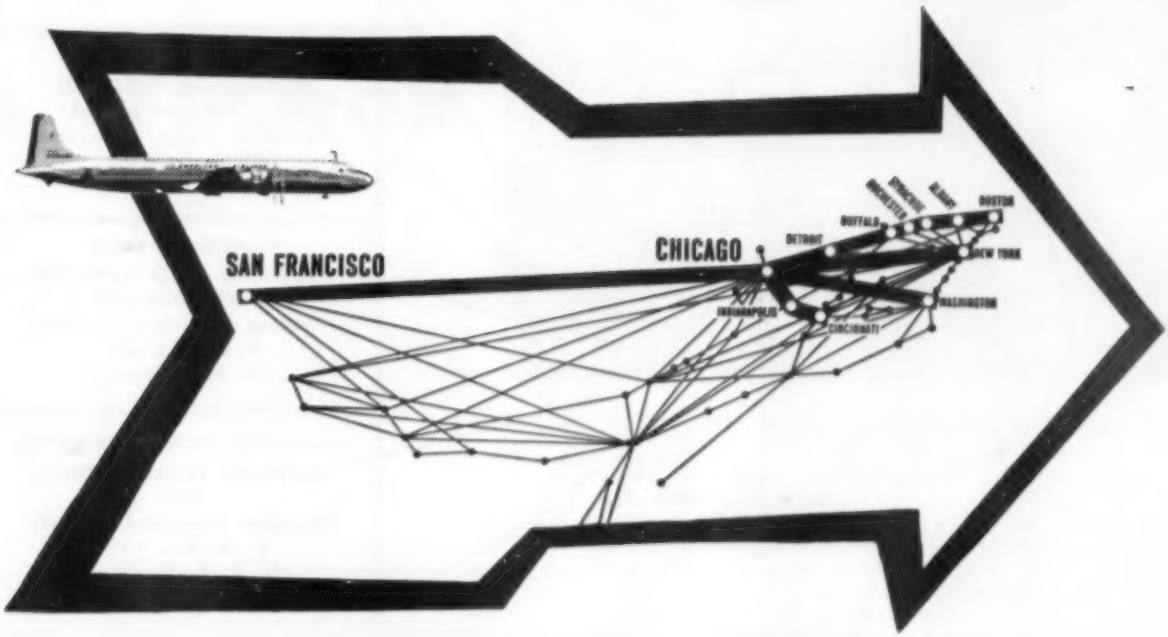

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Mr. H. R. Nevitt

MIAMI, FLORIDA
BLUE STAR AVIATION CORPORATION
(Tamiami Airport)
Tamiami Airport
Mr. Sidney Stein

For further information call, write or wire your local Camair distributor or CAMAIR, Municipal Airport, Galveston, Texas.

The author in the cockpit of the all-weather modified version of the P-40.

By W. KEITH LARKIN

I CHANGE WEATHER

I was a skeptic about this "rainmaking" business until I went to work as a cloud-seeding pilot. The amazing results of my efforts sold me on the idea.

HELLO, CURTISS 23 NECTAR. Cleared for immediate take-off."

The instruments glow dimly as I make a final check of the cockpit, and ease the old surplus fighter out onto the rain-swept runway to line up between the lights. The 1,600 horsepower engine roars smoothly as the throttle is pushed forward. I am forced back in the seat as the plane picks up speed and suddenly we are airborne. As the wheels retract into the wings, I swing on course and begin my climb through clouds to the assigned working altitude.

Now the altimeter shows 18,000 feet—level the nose—power to cruise—instruments rechecked—radar on "stand by"—radio frequency changed. I turn up the radio volume to drown out the noise of the driving rain and the steady roar of the engine. Through the lonely darkness comes a reassuring voice. "Hello, 23 Nectar, this is radar control. How do you read me, boy?"

"Loud and clear. Go ahead."

"We have you in radar contact 35 miles northeast. Proceed from your present position to a moderate storm cell we show at 260 degrees and 23 miles from you. Advise."

"Will do."

Now prepare for seeding run. Radar on "operate"—find the propane valve in the darkness by my right knee and switch to "on"—hit the igniter switch and watch for the tell-tale burst of flame from the generator mounted

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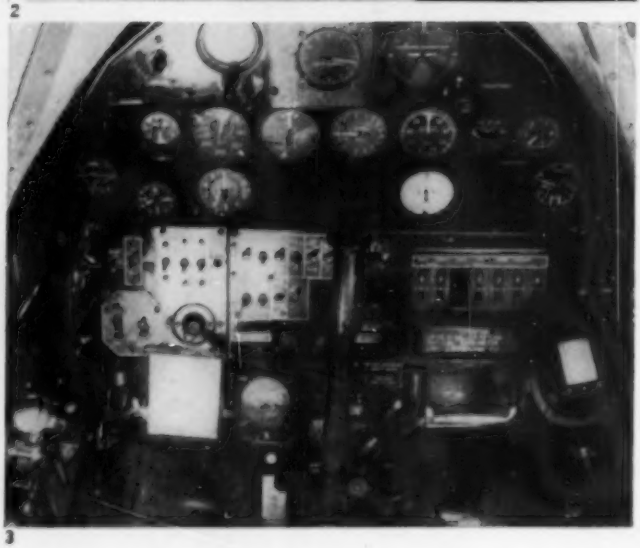

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1
Original P-40 after modification for weather control and research and before radar installation.

2
Another view of P-40 showing radar unit slung under the right wing. Tank between wheels is for auxiliary fuel.

3
Radar scope of P-40 is conveniently located at right knee of pilot. Console is at far left.

4
Radar unit identical to those on the P-40 is mounted under the nose of the P-38.

5
On the P-38, the chemical generator is mounted on left tail boom.

6
Radar scope mounted in center of P-38 panel instrument offers easily interpreted picture of en route weather ahead.

7
C. A. O'Hanlon and John Battle observe operation of experimental generator.

outside on the fuselage—stand by on the chemical switch. I swing the nose to the new heading, and occasionally glance from the fluctuating instruments to the radar scope by my knee.

"We show you one-quarter mile from the cell. Start your seeding run on the airplane radar and advise when completed."

"Roger." There's not much time for casual chatting.

The small radar scope shows the blob of white directly in front of me, and closing in rapidly at my 240 mph speed. Check heading now and hold it—no need to make further radar checks. The first small jolts tell me I am penetrating the edge of the storm. As they increase in intensity, stand by on the chemical switch—ready—*now*—and the seeding run has begun. The plane begins buffeting violently and the instruments become increasingly difficult to read. The turbulence reaches a peak, then lessens as I approach the other edge of the storm. I check the windshield for ice, and see nothing threatening.

Now I am out of the storm, flying in a smooth broken stratus cloud layer. At intervals, lights far below come into view and quickly disappear.

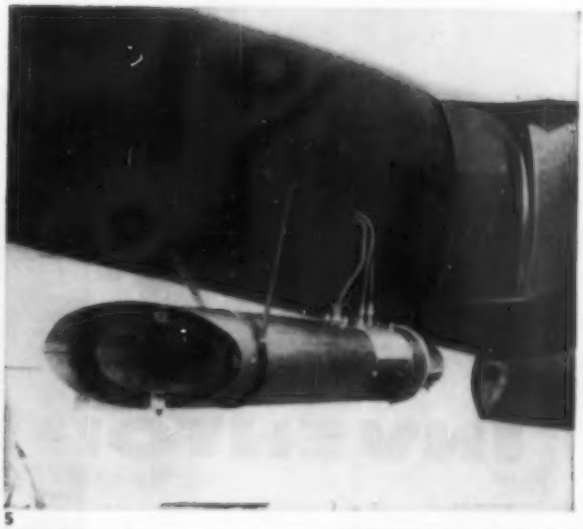
"Seeding run completed. Advise."

I am instructed to proceed to another cell, and then another, and another. After less than two hours which seem considerably longer, I hear the pleasant words, "Okay, 23 Nectar. That's it for tonight. See you tomorrow," and then those inevitable words, "but stand by in case we need you again tonight."

The equipment is all turned off, and the radio channel changed, so clearance to let-down may be received. The long let-down is begun, and finally the friendly runway lights appear under the clouds. Another routine mission is completed, during which the latest techniques and devices known were utilized to further man's relentless battle in gaining control of the forces of weather.

In the past few years, there have been many conflicting evaluations by as many different experts on the effectiveness of man's efforts in weather control. As an unqualified expert, I have had the opportunity for the past year to participate in one company's efforts in this field, and have been in a position to gather some opinions of my own, based on fact rather than theory. These observations were made from the cramped, cold, and lonely cockpit of

4



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6

7

a surplus Curtiss P-40 fighter while flying through innumerable thunderstorm centers in an attempt to change their natural processes by "cloud seeding."

One day last year, I engaged in a casual conversation with two men, which was to result in some of the most interesting and hair-raising experiences of my life. One of these men, gray-haired and distinguished, introduced himself as Charles A. O'Hanlon, president of the Weather Modification Company, of Redlands, Calif. The other, considerably younger, but also graying, was his vice-president and chief meteorologist, John A. Battle.

These men were in search of a suitable surplus World War II fighter plane, which could fly at high altitudes, and operate under instrument and icing conditions with a reasonable degree of safety. Further, this craft had to lend itself to extensive modification for installation of a silver iodide heat generator, a dry ice dispenser, additional instruments, storm detection radar, and if possible, leave room for the pilot. They were also looking for a pilot. After listening to a brief summary of the duties of this pilot, I was quite sure it wouldn't be me. It was.

O'Hanlon and Battle had for some years been operating successful cloud seeding programs under contract to groups needing increased rainfall or hail protection. In conjunction with this, they had meanwhile been experimenting with new techniques in weather control, and felt they had come up with at least a partial answer to many of the problems encountered. This answer was to be achieved through the coordinated use of a mobile storm-detection-radar and meteorology station, and a rugged, high altitude airplane. To supplement these, a newly developed low-power ground generator would be used.

The airplane was to be vectored into storm centers by radar, take readings on pertinent meteorological data, and seed the cloud accordingly. "This is just a start, and there is much to be learned yet," admitted O'Hanlon during our first discussion. That statement placed them in the lonely category of the few "rain makers" who don't claim ability to perform miracles with weather. However, it did inspire my confidence. They believed also that the effects of seeding storms was highly localized, and planned to confirm this belief through radar observations of actual seeding operations.

After terminating this discus- (*Continued on page 59*)

The amateur inventor has always been the backbone of progress. It is the purpose of this article to make

EVERYONE AN INVENTOR

By CAPT. P. V. H. WEEMS, USN, RET.
and
G. D. DUNLAP

NEW DEVELOPMENTS, as all businessmen know, are the lifeblood of every field of endeavor. With the phenomenal growth of aviation in the last few years, all associated sciences are particularly interested in keeping pace with this growth. This is especially true in the field of navigation. The use of any type of aircraft is limited to the ability of the crew to navigate it accurately and safely. Publication of useful ideas and developments is the best possible incentive to encourage others to come forward with ideas.

Having been closely associated with military and commercial aspects of navigation for many years, we have had literally thousands of ideas and designs presented by individuals. Of these, perhaps a hundred have actually been manufactured and promoted by various concerns. Some have become standard equipment, accepted by military and commercial navigators. The majority of ideas submitted have been basically correct in principle in that they can solve the problem for which they are designed.

To become successful, a prospective inventor should concentrate on developing an instrument which will solve a new problem or present a different approach to solution of an old problem. The number of similar instruments submitted within a short time by individuals who have no knowledge of other related developments is surprising. This is generally indicative of the need for a better solution to the problem involved than that currently in use. In designing a new plotter or computer, for example, the tendency is generally toward trying to produce an instrument which will solve every known problem, with the result that the most commonly used computations are not solved in the most convenient fashion. One should, instead, completely analyze the basic problem and devote his energies toward solving it in the simplest possible manner.

A good illustration of this is the Weems Aircraft Plotter, Mark II (Fig. 1). This instrument was designed basically to measure courses and distances, although it now has many other uses. After having produced roughly 50 different designs, the Mark II was decided upon and manufactured. Over a million have since been distributed with no changes in design. (*Continued on page* 66)

Fig. 1. Weems Aircraft Plotter, Mark II.

Fig. 2. Pressure Pattern Plotter.

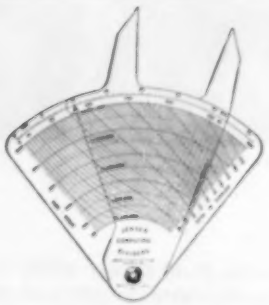


Fig. 3. Jensen Computing Dividers.

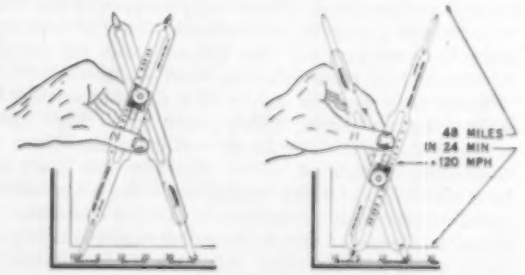


Fig. 4. Weems Proportional Dividers.

These three Akron men (left to right) Ernest Stadvec, George Maddox and Jack Stark, pooled their aviation and business backgrounds to put an airport about to fold back on a paying basis.

GOOD MANAGEMENT SAVES AN AIRPORT

How three smart businessmen put a run-down flying field back on its financial feet.

By ERNEST STADVEC

CAN A SMALL AIRPORT and its operator survive on private flying and maintenance alone when proper management principles are applied to its operation?

Three Akron businessmen, interested in private aviation and not wanting to see another field go under, believed it could be done—and are doing it. The three, Jack Stark, sales manager for a trucking concern, George Maddox, a full-time instructor and Ernest Stadvec, a radio sportscaster, combined their efforts in the Maddox & Stark Flying Company, at Gibson's Airport in Copley, Ohio, just outside of Akron.

The firm took over the faltering operation, which was one step away from folding, last April. One airplane, an Aeronca *Champ*, belonged to the company at the time, and ten privately owned aircraft were based on the field. The operation now has five airplanes of its own, and 20 privately-owned aircraft call Copley Airport home.

Initial investment to take over the field was $2,000 of new money. The operators now value their total investment in the field at $12,000, counting aircraft owned and shop equipment purchased. At the time the change came about, the operation owed five months back rent ($350), plus a raft of other bills. Money in the bank amounted to $370, with accounts receivable totaling $775. The operation has $1,000 in the bank at present and all bills have been paid. Sound business policies have completely reversed the economic and potential situation of the field.

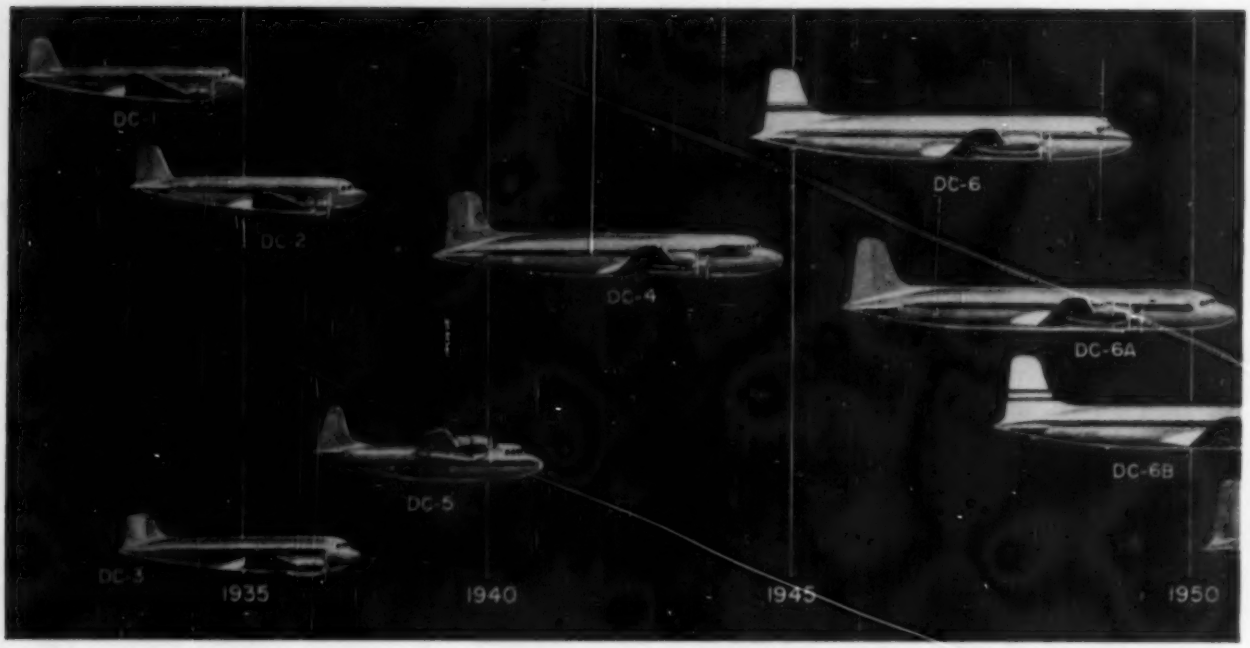
Copley Airport has been transformed, in this short space of time, from a white elephant into a going concern.

When the present operators took over, they had immediately to buy more airplanes. Bank financing was arranged by Jack Stark. This took a bit of ingenuity since banks have been known to look unfavorably on loans for purchase of small aircraft. Jack, a sales manager for an Akron trucking concern, made excellent use of business contacts to arrange for separate loans to buy a J3 *Cub*, an *Ercoupe*, and two Fairchild 24's. A twin Cessna also has been leased. Stark put up stock as collateral to get personal loans and obtained the necessary money from an Akron bank. These were then paid back out of the receipts from the business. All but one bank loan has been paid to date.

This system for raising the necessary money will be repeated when other "good buys" in aircraft are found.

A foot of water covered the shop floor while the roof sagged wearily. Not one hangar door could be closed and the rollers were jammed and rusty. Debris blown in by winds and prop blasts littered the floor. Inside the office, the windows were broken and pieces of plasterboard hung from the ceiling. Outside, the ramp, taxiways and single NW-SE runway all were in sad condition with chuckholes and bumps everywhere.

"Business" turned over to the new operators, amounted to two students who had all but given up the idea of learning to fly, several ex-charter customers, a number of rental customers, also "ex," plus 10 disgusted aircraft owners ready to pull out and go elsewhere. Add to these some delinquent repair, maintenance and rental accounts and you come up with the old (*Continued on page 77*)



The genealogy of the DC-8 is traced back through an impressive line of world-famed air transports.

TRENDS IN AIR TRANSPORT

By DONALD W. DOUGLAS, JR.

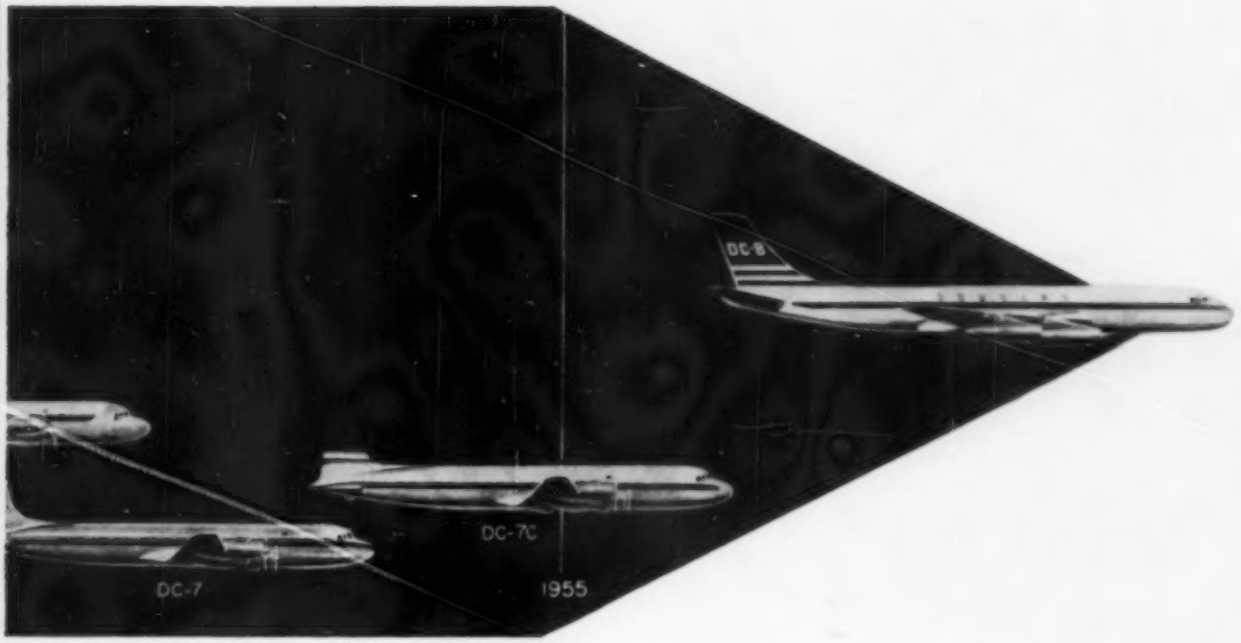
The author, Donald W. Douglas, Jr., Vice President—Military Sales and Director of Douglas Aircraft Company, Inc., joined the company in October, 1939 upon graduation as an engineer from Stanford University and the Curtiss-Wright Technical Institute.

"WHAT EARTHLY USE would the military services have for a four-engined transport?"

In one of the early dark days of World War II, a high government official used just those words in response to a proposal from the Douglas Aircraft Company. (Before the war was over, our company alone had built 1,200 four-engined transports for the military services and these planes had crossed the two great oceans more than 80,000 times.)

This now almost incredible incident is cited to underscore the swift maturing of the concept of air transport during the past 15 years. Not too long ago, defense officials firmly believed that the appropriate way to provide for war-time airlift was to commandeer aircraft from the civil fleets. Today, the philosophy of air logistics calls for substantial progress every passing year. It has become a military axiom that the defense air transport fleet must be constantly maintained on a full-support basis since the services gear many of their tactical operations to the speed and mobility of air logistics. In fact, this concept has become so fundamental a part of modern thinking that the aircraft manufacturer is frequently hard-pressed to keep abreast of service requirements. And it certainly assures him of an attentive audience when he is able to advance aircraft designs capable of increased logistic air support—with compatible economy.

Naturally, the aircraft industry always follows with close absorption the requirements of air logistics, commercial and military; and there seems to be considerable evidence that evolution toward the high-capacity, high-speed, military cargo and personnel carrier is approaching a new phase. Parallel development of aircraft which will be common to both military and civilian use, as well as the specialized military types, has brought us far from the urgent days when passenger transports were hastily converted to freight haulers and bombers were, willy-nilly, modified to makeshift fuel carriers. Perhaps it



would not be amiss if, to give perspective to the vistas of the future, we were to take a brief look at the foundation upon which Douglas will build the DC-8 for the world's civil airlines, and the C-132 and C-133 for the U. S. Air Force.

Our design and construction of multi-engine transports started in 1932-33, when the first DC-1 was built for Transcontinental and Western Air. By the middle of 1935, that airplane had established 19 records for speed, payload, and range achievements. Direct successor of the DC-1 was the DC-2, made possible by an improved power plant. Approximately 140 of the type were built, of which one, operated by KLM, won the transport division of the London-to-Melbourne race in a memorable exhibition of the merits of range-plus-block-speed over mere speed.

In December 1935, an elongated version of the DC-2 made its first flight, and the famed DC-3, of which about 11,000 were eventually built in civil and military configurations, was on its way. The war-time development of the four-engined DC-4/C-54 needs no elaboration.

Following the war, the DC-6 became available. (The DC-5 did not survive war needs.) In many respects, the DC-6 is to the DC-4 what the DC-3 was to the DC-2. The pattern is one of matching suitable and improved power plants with increases in strength, space, economy and passenger appeal of the complete aircraft.

With advent of this type of aircraft came remarkable upturns in airline traffic all over the world. From 1943 to 1952, U. S. domestic passenger miles rose from 6 to 13 billion, and global figures were essentially double these amounts. During this period, the DC-6 took advantage of improvements in the R-2800 engine and was expanded to the DC-6A cargo plane and the DC-6B, with improvements again in speed, range, and payload over the original DC-6. Also during this time came the first serious effort to evaluate the position of jet power, either direct or turbo-prop, with respect to commercial air transport. The military effort was moving rapidly from piston to jet, and the big question was—when would the jet offer commercial reliability?

While a number of possible engine—airframe combinations were being explored, the Curtiss Wright Company came up with the turbo-compound 3,350, probably the most efficient large piston engine ever to be developed. Application of this engine to the DC-6 airframe offered not only an opportunity to increase range and payload, but to produce a speed change similiar to that of the DC-6 over the DC-4. Timing of the jet engine picture allowed an adequate period for development and utilization of the DC-7. The capabilities of this transport, with a cruising speed of 360 mph, permitted the airlines for the first time to offer non-stop transcontinental schedules, both east and west. This generated a further increase in passenger travel. Once this pattern was created, and it effects noted, there was a demand for similar improvement in over-water operations. This took a little doing, since with the DC-7 we had used all available wing fuel space. After consideration of tip tanks, slipper tanks, etc., it was decided to increase the span of the wing. This step created the DC-7C.

The studies which have led to the DC-8 were begun more than five years ago and, for the past three years, design work has been underway at an increasing tempo. We have drawn, in this instance, not only on the experience which stems from the DC-1, but also on our military experience with high speed jet aircraft.

As the DC-8 evolved, step-by-step, from the days of the DC-1, so has the pure military cargo carrier come into being since the war. Shortly after Pearl Harbor, the all-out effort of plane builders, at the direction of the military, was concentrated on tactical aircraft. However, it soon became evident that even wholesale commandeering of the civilian air fleet would not fill military requirements. Consequently, two dozen (*Continued on page 62*)

THE AIRMAN'S WORLD

You've been cruising the brooding hills under
heavy skies—maybe a little lonely and a
bit uncertain—when suddenly the westerning sun
finds a slit in the canopy overhead.

Long after you've forgotten the sweat of the journey
you'll remember the glimpse of that sunkissed
valley with the fingers of the hills all pointing
to it as though fearful that you might
miss its loveliness.

When you've flown enough years to have
crossed many hills and valleys, and known much
loneliness and endured many uncertainties—why then
you're a pilot, and on the walls of your memory
are hung such frescoes as no other breed of
man has ever seen. And because of them you can
never grow too old and you can never be too
much afraid of what lies ahead.

Just as the fact of flight telescopes time and space,
so the experience of flying telescopes the
pattern of life itself for the airman.

If you don't venture on sullen skies, you never
come to sunkissed valleys. If your palms have never
been moist, your heart has never thrilled. If you
have never been afraid, you have never been courageous.

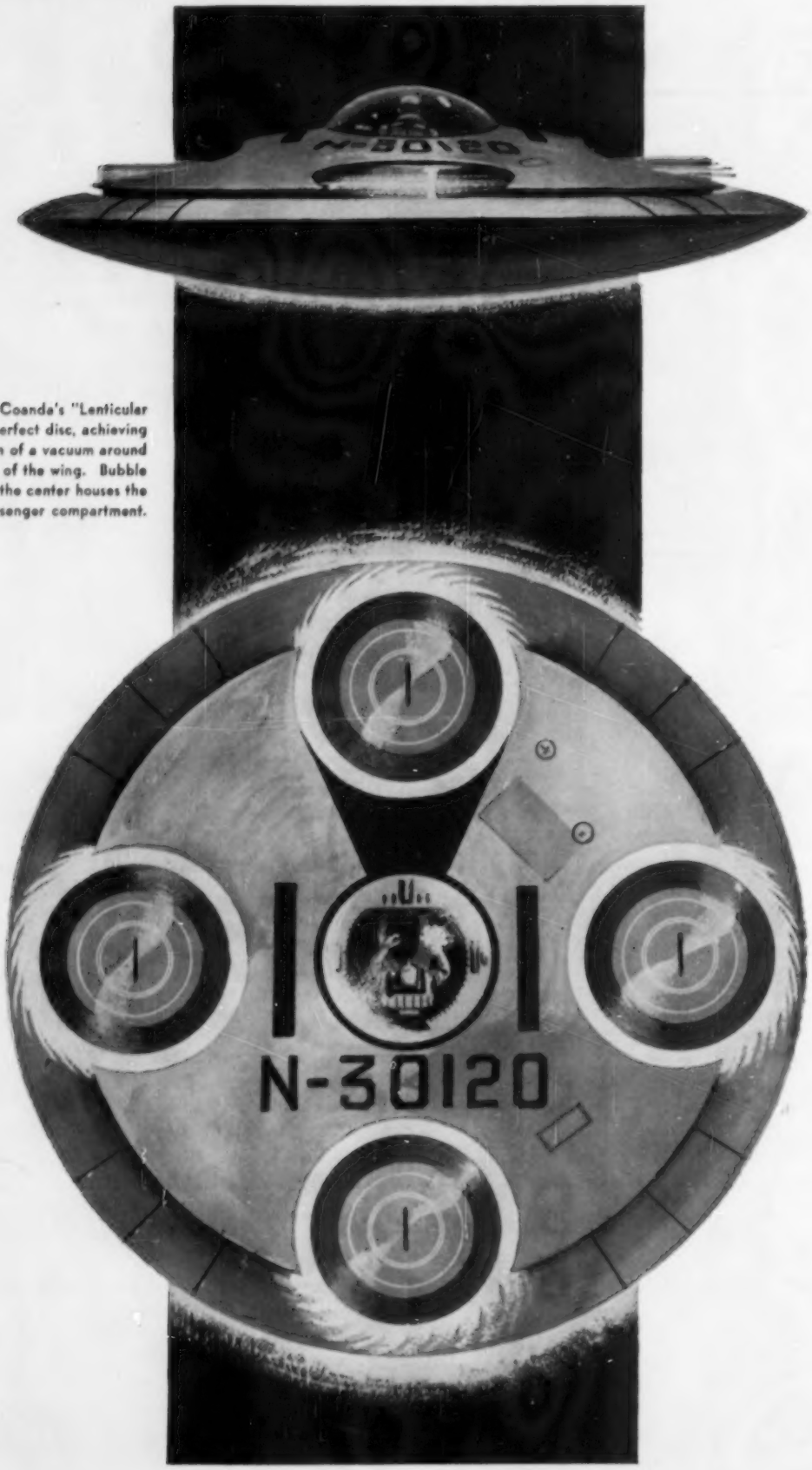
You have learned that if skies were always
cloudless, the hills and valleys beneath would be
barren. You have seen primordial forces at
work beyond the control of any man, but you have
fashioned a skill to live with them
in security and peace. You have sensed that where
there is no challenge there is no achievement.

So I think he learns of life, this one with the seven
league boots, this airman who goes from
place to place with such swiftness that even the
moods of the sky itself are
all caught up in his going and coming.

And if it does not mould him in humility of mind
and in peace of heart—and if he does not
become in spirit at one with the fingered hills
pointing eternally to some bright human hope which
nestles in the shadows of a sullen
history—then I have not read with understanding
for most of a lifetime the long, long thoughts
of my confreres—they who have earned a
citizenship in the airman's world.

GILL ROBB WILSON

Photograph by Fairchild Aerial Surveys, Inc.



Coanda's "Lenticular Aerodyne" is a perfect disc, achieving lift by creation of a vacuum around the edge of the wing. Bubble canopy in the center houses the passenger compartment.

Henri Coanda, the inventor of the first jet to fly 46 years ago, has come up with a new concept of propulsion—the "Lenticular Aerodyne".

THE COANDA STORY

By MARTIN CAIDIN

IN THE PENTAGON recently, I was shown design sketches of a disc-shaped aircraft which had high speed, ability to hover, and could rise and descend vertically. This so-called "flying saucer" project has been taken over by the USAF from Avro Aircraft Ltd., of Canada.

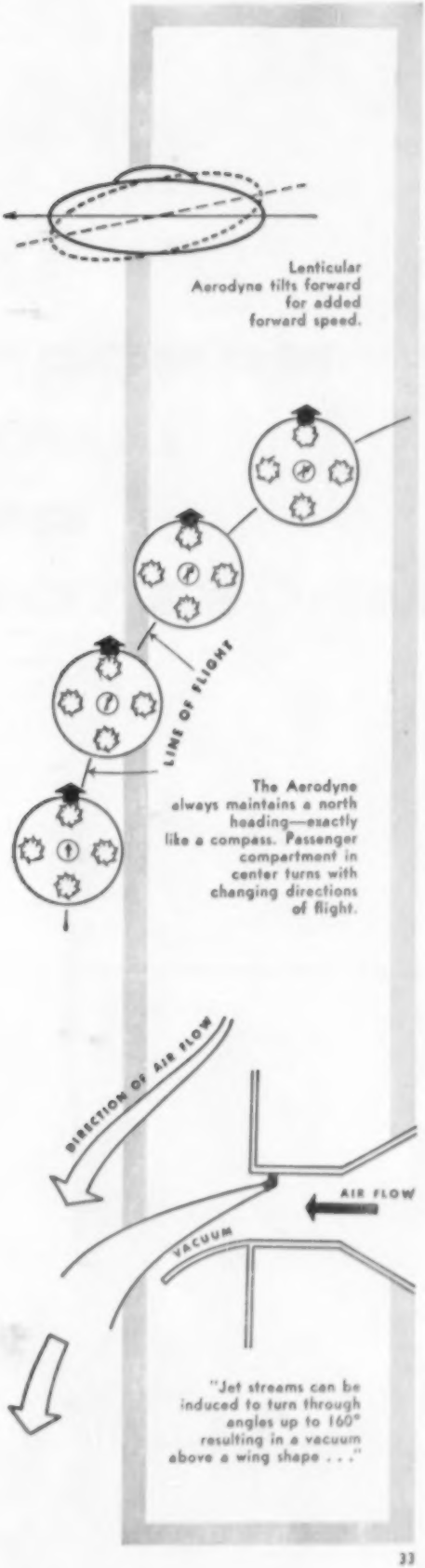
The disc machine achieves its extraordinary performance through a phenomena known as the "Coanda Effect". Engineers have long known, from the work pioneered by the brilliant French Professor, Henri Coanda, that if a jet of gas is discharged adjacent to a surface, the flow tends to follow the wall contour even where the surface curves away from the original jet axis. Jet streams can be induced to turn through angles up to 160 degrees, resulting in a vacuum above a wing shape, with a corresponding high lift from below the wing.

I was told: "If we had listened to Coanda many years ago, and turned our engineers loose to develop his theories, jets would have been with us several decades before now. Coanda actually flew a jet in 1910."

This was news to me. So far as I knew, and according to all the reference volumes, the first jet flight was not made until August 27th, 1939, when the Heinkel H-178, powered with a Heinkel-Hirth gas turbine unit, reached a speed of 250 mph. But if Coanda actually had flown in 1910—why, then we had had a jet flight *46 years ago!*

The offices of *Air France* in New York arranged a meeting with Professor Coanda, so I could learn at first hand of the unprecedented work this man has accomplished in the field of aeronautical science. Coanda's extraordinary story began, as with so many of the great air pioneers, when he was able to watch the experiments of other men then attempting to develop various models of the new "aero machines." In 1904, Henri Coanda witnessed the experiments of the Frenchman, Clement Ader, who seven years before had briefly managed to become airborne in a steam-powered airplane.

After several months of study with his close friend, Ferber, Coanda started to design his own aircraft and, in 1909, entered the School of Ad- (*Continued on page 50*)


Lenticular Aerodyne tilts forward for added forward speed.
LINE OF FLIGHT
The Aerodyne always maintains a north heading—exactly like a compass. Passenger compartment in center turns with changing directions of flight.
DIRECTION OF AIR FLOW
AIR FLOW
VACUUM
"Jet streams can be induced to turn through angles up to 160° resulting in a vacuum above a wing shape . . ."

Ignition is a mystery

to many pilots and aircraft owners.

Here is some non-technical

HANGAR LORE ON MAGNETOS

By M. C. ANDERSON

THE MAGNETO HAS BEEN on the aviation scene since the earliest days of the internal combustion engine—a basic consideration of every pilot and aircraft owner—future as well as past. Yet rarely do we find any discussion of magnetos and it strikes me that the subject must be of interest to our several hundred thousands of private airmen and upcoming mechanical students.

Veterans of "cow pasture" flying days will recall that back yonder there were almost as many makes of magnetos as of aircraft. Time weeded them out and today only several stabilized trade names remain. Because Scintilla is representative of the garden variety of light aircraft engine magneto—its SB and SF 2, 3, 4, 5 and 6 series—we will choose it for discussion.

The next time you're "grounded" with the family lawn mower, take a closer look at the one-lung kicker that powers it—if you're lucky. Most pilots would never expect to find anything resembling an airplane on a lawn mower. But wait a minute—where does the ignition come from? No battery to charge. You just kick the starter pedal and away she goes. That's right—a magneto. And if you've ever carelessly leaned against the spark plug with the engine running, you'll have a healthy respect for its potency. The innards are hidden inside the flywheel, but basically your lawn mower engine gets its spark in the same way as an aircraft engine.

Your airplane uses a magneto for the same reason your lawn mower does. The unit is lightweight, dependable and requires very little service. You can comfortably hold a light-aircraft magneto in the palm of your hand. Small as it is, the magneto incorporates a rotating magnet to produce electric current, an induction coil to boost the voltage, a set of breaker points to time the spark (and a condenser to keep them from burning) and a distributor to route the spark to the proper cylinder.

On your automobile, it takes a battery-generator team,

Fig. 1 ▶
A 4-cylinder, flange-mounted model (left); a 6-cylinder, base-mounted model (center) and a 5-cylinder, base-mounted model (right) of the same basic magneto.

◀ Fig. 2
The felt which oils the cam follower should be moistened when dry with an SAE 60 or heavier oil.

The timing marks inside the window indicate the #1 firing position of the magneto.
▼ Fig. 3

a coil and a distributor to do the same job.

Basically, the magneto is very simple in operation. The model we are concerned with here uses a rotating magnet which is driven from the rear of the engine. The rotating magnet creates a moving magnetic field which induces a low-voltage current in the primary coil of the magneto. When the flow of primary current is at a maximum, the breaker points open and the sudden collapse of current flow in the primary causes a high-tension current to be induced in the secondary section of the coil. This high-voltage current is carried through the distributor to the spark plugs.

Routine maintenance isn't complicated and will further increase the life and dependability of the magneto. Here are a few pointers for those of you who maintain or fly behind these magnetos.

First, a word about models. The model designation describes the magneto, tells how it is mounted to the engine and how many cylinders it is built to fire. For example, an SB 4 is a single—having only one coil and one set of spark plug leads—base-mounted magneto, firing four cylinders. For double ignition with this type of mag, you mount two per engine. An SF 6 is a single, flange-mounted, 6-cylinder magneto. Fig. 1 shows three different versions of this series.

The only on-the-line lubrication these magnetos need is an occasional drop of heavy oil on the cam-follower felt, Fig. 2. Don't use anything lighter than an SAE 60, and if the felt is still wet, don't oil at all.

General maintenance should include a periodic check of the breaker compartment. Wipe this clean with a dry rag. *Do not* use solvents. If the contact points are sooty or oily, clean them with a little carbon tetrachloride (fire extinguisher fluid). Oil or soot on the breaker points may come from several sources. Too much oiling of the cam-follower felt may be a cause. A careless wash-down of the engine may have forced solvents through the magneto vent openings. Even cleaning compounds left on the engine after a wash-down can cause trouble. Low volatile cleaning compounds may not evaporate until the engine is heated, remaining on engine parts as an oily film. When the engine is run, the space inside the cowling is saturated with oily vapor, which is drawn into the magnetos through their vents. The result is a black smudgy deposit on the breaker points which causes rapid burning or fouling.

If it is necessary to clean the points, be careful not to leave lint or other foreign particles between the surfaces. A clean piece of thick white paper may be used to clean the contact surfaces. Pull it between the points until it comes out clean. In cleaning or checking the points, open them only 1/16 inch, or the result may be a weakened spring that will cause the points to "bounce" at high speed.

Small pits or mounds sometimes develop on the surface of the points after continued use. These do no harm so long as the points do not show evidence of excessive arcing. Do not attempt to file or otherwise dress the contact points. Points that have begun to give trouble should be replaced.

Timing is one of the great mysteries to airmen who don't know their magnetos, so let's look at that next. Usually when a mech speaks of timing a magneto he means timing it to the engine. Actually, a magneto must be internally timed, as well as timed to the engine. Since this is bench work, let's stick to engine timing for the moment.

On most engines, the magnetos fire at the same time or are "synchronized." On others, due to design, performance is improved by "staggering" the spark. That is, one plug fires later than the other. Stagger is specified by the engine manufacturer and is given in degrees of crankshaft rotation between the firing of the two plugs in a cylinder. Actually, the (*Continued on page* 73)

◀ **Fig. 4**
Contact point clearance is adjusted to correct magneto internal timing by loosening these screws.

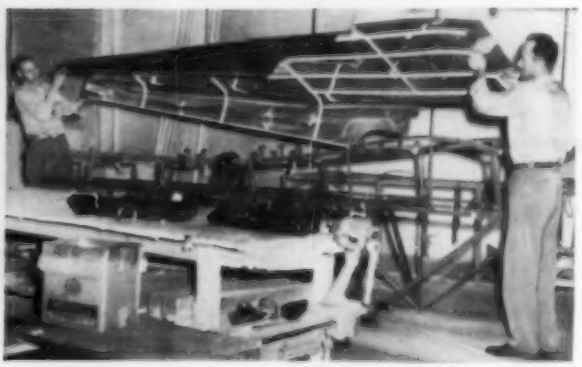
▲ **Fig. 6**
A simple bench test is to flip the magneto over by hand while holding a lead to form a spark gap against the case. Magneto should throw a hot blue spark on all terminals.

Fig. 5 ▶
The condenser is reached through a plug on the bottom of the magneto.

Above: Tom Hebert shows metal fuselage conversion on Piper *Pacer*.

Hebert points out tricycle gear conversion of a Cessna 170.

Above: New Cessna 180 with a MetcoAir tricycle gear conversion. Below: Top of a MetcoAir Stinson 108 fuselage kit.



The average private pilot is a cinch for conversions. Many of these modern modifications are brain children of "the man with the metal skins."

Master Modifier

DON DOWNIE

FULLERTON AIRPORT NEAR Los Angeles is one place where pilots scarcely glance twice at unconventional airplanes. Six years ago a Stinson 108 taxied out with metal wings. Later it sported a shiny metal fuselage. Then came similar skin on Ercoupe wings, Cessna 120's, 140's and 170's. The SR Gull Wing Stinson came out in hard cover and later the Piper J-5, PA-12 and PA-14 displayed metal fuselages.

Habitués of Fullerton, however, did a "double take," when a Cessna 170 taxied with a tricycle gear, 18 months before the factory announced the 172. Now a Cessna 180 with tricycle gear is a common sight at Fullerton.

There's just one reason for all this conversion activity and its name is Tom Hebert, president of MetcoAir.

Hebert has been in the aviation business most of his 42 years. He grew up in the era when youngsters hung around flying fields and dreamed of becoming pilots. He soloed at the illegal age of 14, starting in a clipped-wing *Cycloplane* which merely taxied up and down the runway of now defunct Alhambra Airport. The ground trainer had neither wingspan nor horsepower to fly. After mastering this device, Tom graduated to the full-spanned model and soloed in less than three hours. "It really wasn't a bad way to learn," he muses.

Absorption with aviation hampered the boy's formal schooling and, after two years of senior high, he left to assemble planes for Romer Aircraft Company of East Pasadena. The company built a few OX-5 biplanes which Hebert believes were later smuggled to Central America. For a generous schooling in the fundamentals of mechanics, Hebert next signed on with the then young Douglas Aircraft Company in 1935. He stayed with Douglas through World War II and worked up to flight line inspector. He was scheduled to take engine temperature readings on an experimental flight which ended in tragedy but missed the flight because a supervisor changed his assignment to testing equipment in an SBD. Apparently destiny had a special chore left for Tom. After the war, he opened an aircraft modification center at Fullerton Airport, catering to the conversion of War Surplus planes. He modified three Boeing 247's for SCATA of Costa Rica. One, he believes, is still flying and another was shot up during a revolution.

A Cessna 170 which has been converted to tricycle gear.

Included with this conversion shop was the local Stinson dealership, which accidentally led to the formation of MetcoAir. Hebert was ferrying a 108 across Los Angeles when a faulty fuel gauge tricked him into running out of gas. He landed the Stinson in a tiny bean field and flipped it over. When the 108 was back in his shop for repairs, Hebert decided to put metal skin on the wings since they were already completely uncovered. He attached the wings to the plane to establish the correct amount of wash-out at the tips and merely riveted .020 gauge skin over the existing structure.

"CAA said I had holes in my head," explains Hebert, "that it couldn't be done and that the plane would probably have to be condemned because the weight and flight characteristics would be all wrong. But I went to work on my engineering and, six months later, CAA approved the wings.

"The Stinson wing conversions flew fine, but we sold only six kits for the wings alone, so I started engineering a fuselage kit. There seemed a good market for the complete metal skin since even fabric recovering on a Stinson cost from $1,000 to $1,800. After nine months work and $10,000 engineering investment, I had a licensed kit made of two metal half shells, top and bottom, retailing for $1,315. We changed the fuselage design lowering the aft end three inches to get the stabilizer out of the downwash and thus decrease buffeting at slow speeds. The metal kit lowered stalling speeds as much as eight mph and added three or four miles to the cruising speed by cleaning up the air flow around the stabilizer."

Once they reached the market, over $300,000 worth of Stinson skin kits were soon sold. One of the first conversions went to the McMahan Aerial Pipeline Patrol of Monroe, La. Mr. McMahan now owns ten Stinsons, all metalized.

It is impractical for a plane owner on the East Coast to fly his "rag wing" to Fullerton so MetcoAir began to set up representatives and now has 73 dealers based from Hyannis, Mass., to Fairbanks, Alaska.

Following the original Stinson kits, MetcoAir came out with a 13 gallon auxiliary fuel tank for both the Stinson and Cessna 170. Four Gull Wings were metalized completely with the addition of only 33 pounds to the completed airplane. Metal skins for the Cessna 120 and 140 have proven one of MetcoAir's most popular items with over 400 kits now in the air. Metal wings came out for the Cessna 170 and metal fuselages appeared for the Piper line. MetcoAir now builds all its kits at what was once Cypress Airport, six miles from Fullerton. Until recently, Hebert could fly his conversions from this small dirt field, but currently the airport is closed and he must truck everything to the Fullerton Airport for assembly.

Hebert believes his most complicated kit was the Cessna 170 tricycle gear conversion. "We not only had to prove that our kit could stand (*Continued on page 75*)

The annals of American airpower
are being preserved and perpetuated for posterity by the

AIR FORCE HISTORICAL FOUNDATION

By ORVIL A. ANDERSON, MAJOR GENERAL, USAF (RET)

LARGELY unpublicized, but aggressively at work since it was organized on February 20, 1953, The Air Force Historical Foundation has already made a vast collection of significant materials on aviation history—personal papers, books, relics, paintings and manuscripts.

Private citizens, industrial agencies and kindred sources, having material bearing on the activities and traditions of American aviation—and wishing them to be preserved and located for posterity—are sending them to the custody of the Historical Foundation, Maxwell Air Force Base, Ala., where the Foundation works in close cooperation with the official Air Force Historical programs.

Welcoming to membership all interested citizens of good repute who have an interest in airpower, the Historical Foundation broadens the base of such interest so that civilians and military personnel are blended in one comprehensive intellectual purpose.

Always in the forefront of the Foundation's purpose is the endeavor to free the future from slavery to outmoded experience. Preservation of obsolete military patterns which are inadequate to future conditions has cost many a nation its existence.

Experience, as traditionally cited in military history, has often been accorded a capability it does not merit in solution of current or future problems. The validity of experience must be limited to specific factors of any test. When factors change, experience may well become a subtle enemy rather than a valued friend.

A major effort of the Foundation is clarification of the contribution that historical example can make within the limits of its legitimate context.

To provide a vehicle for its studies, the Historical Foundation has created a publication, "The Air Power Historian," which will study history for its flaws as well as its achievements.

In addition to its service to unfettered thinking, the Historical Foundation is dedicated to the preservation of the annals of American airpower, particularly of the Air Force and its predecessors. Various materials which come into its custody will be located at such points as best serve to depict the history, culture and traditions of the Air Force. The Air University, The Air Academy, the Air Museum at Dayton, along with various significant Air Bases and general purpose museums will be repositories of example.

"The Air Power Historian" intends to present in popular style authoritative information about Air Force heroes and Air Force incidents of importance. Currently being featured are stories on the development of the Air Force and the early struggles for recognition. Gen. Frank P. Lahm presented the first of the series. Gen. Benjamin D. Foulois has continued through two series, and Gen. T. DeWitt Milling will present the fourth of the series. In the first issue of 1956, General Foulois will return with the story of the 1st Aero Squadron, its development, its Texas campaign, and the association with the army in the war against Mexico. Also in each issue an attempt is made to include items of editorial significance, treating primarily with the significant contributions of history to the expanding complexities of warfare.

The Foundation very shortly will sponsor a traveling exhibition of paintings (by artists of The Society of Illustrators) which depict scenes of Air Force activities all over the world, past and present. A speaker service is available for the distribution of historical information to meetings of important public groups. A series of tape recordings, the first of which has been completed, on the early flying struggles by Generals Lahm, Foulois and Milling, will be available on a loan basis to agencies having good use for them.

The Foundation receives its sole support from contributions and from members of the organization. All contributions are tax free.

Because the Foundation is in its infancy, and because it has outlined a healthy robust plan of operations, new members are constantly being solicited. Initial and Annual membership fees are $3. Life membership is $100. Patron Life membership is $1,000 to $5,000 and Benefactor Life is $5,000 or above. Membership and information may be secured by writing directly to the Executive Director, Maj. Gen. Orvil A. (*Continued on page* 63)

RUBBER PLANE An inflatable rubber airplane that can be deflated and packed in the trunk of the family car is being flight tested by Goodyear Aircraft Corp. Designed to test possibilities of rubberized Airmat fabric as structural material for aircraft, the lightweight plane is made rigid by low air pressure. The single-place plane has a two-cycle, 40-hp motor mounted on a tubular support above the fuselage behind the wing. Only other metal support connects the wheels and pilot's seat with the fuselage. Wing, tail and seat are made of airmat material, a Goodyear Tire and Rubber Co. product consisting of joined layers of inflatable rubber-coated nylon fabric shaped by thousands of dropped pile threads. The conical shaped fuselage is made of airship fabric. Less air pressure than required to inflate a passenger car tire is needed to pump up the plane. Goodyear designed and built the inflatable plane in little more than 12 weeks. Quantity production is not planned.

HAVE YOU SEEN?

DOUGLAS C-133A Newest and largest Douglas military transport, the turbo-prop C-133A is designed to replace the C-124 *Globemaster*. The mammoth plane has twice the C-124's payload, to date the largest military transport in service. Parked on a football field with the nose at the goal line, the C-133A would extend to a point just two feet short of the 50-yard line and its wings would reach 10 feet over each sideline. Gross weight is 255,000 lbs. It is powered by four P & W T34 turbo prop engines driving three-bladed Curtiss Wright turbo-electric props. The cabin is pressurized and heated. A crew of four will handle the plane—pilot, co-pilot, navigator and systems engineer. The C-133 stands close to the ground on dual nose wheels and main gear consisting of two sets of four wheels each. Main gear retracts into faired pods on sides of the fuselage. Two loading doors provide access to the 90-ft long cabin floor which is at truck-bed height.

HAVE YOU SEEN *in foreign skies?*

ITALY Left: A single-seat sport plane, the Partenavia *Aeroscooter de Bernardi* P-53 is powered by a CNA 35-hp engine, has a maximum speed of 93 mph, cruises at 74 and stalls at 37. Ceiling is 11,480 ft. The P-53 has a fixed type tricycle landing gear. Its empty weight is 330 lbs., useful load 220. The Partenavia Costruzioni Aeronautiche of Naples, Italy has also designed and built a two- and a three-place light plane for sport use. The P-55 *Tornado* is a two-place side-by-side craft with retractable gear and powered by a 140-hp Lycoming. The P-52 *Tigrotto* is a three-place craft powered by a 90-hp Continental, and a slightly larger version, the *Tigrotto II* is powered by a 135-hp or a 150-hp Lycoming.

FINLAND Right: When Juhani Heinonen, a Finnish aeronautical engineer, wanted a sport plane for himself, he designed the HK-1 and had it built at the Jami Soaring School. Costing about $3,500, the single-place plane is powered by a Czech Walter *Mikron III* of 65-hp, has a wooden prop and a 13-gal. fuel capacity. The fuselage and tail are plywood covered all-wood structure, with fabric covered rudder and elevators. Split flaps are of alclad sheet and dural torsion tube. Maximum speed is 135 mph, cruise 115 and landing speed 47. Empty weight is 550 lbs, gross weight 880 normal or 798 aerobatic.

FREE CHINA Left: Developed for the Nationalist Chinese Air Force on Formosa as a liaison and observation craft, the two-place CJC-3A tandem rotor helicopter was designed by Maj. Gen. C. J. Chu, chief of the China Aircraft Production Bureau, and one of the important leaders of the Free Chinese aviation industry. Powered by a 190-hp Lycoming, the CJC-3A has a maximum speed at sea level of 92 mph, cruise of 83, vertical rate of climb of 546 ft/min., hovering ceiling of 7,400 ft., absolute ceiling of 16,800, range of 130 miles. Empty weight is 1,500 lbs and useful load is 550.

BRITAIN Right: An ultra-light helicopter for use by the British Army as an air observation post and liaison, this Fairey helicopter is powered by a 252-ghp Turbomeca *Palouste* engine which supplies compressed air to the Fairey pressure jets at the rotor tips. The craft carries two. Designed for field use, it can be lifted manually and transported on a three-ton truck.

GERMANY Left and above: Known as the HD-153 *Motor-Move*, this two-place side-by-side light plane is powered with either a 65- or a 90-hp Continental. With 65-hp it has a top speed of 102 mph, cruises at 90 and lands at 37; while with 90-hp its top speed is 124 mph, cruise 105 and landing 37. Take-off run is about 460 feet and landing run 262. The wing and tail assembly are detachable for road transportation. The plane was designed by Heino Dittmar and is being distributed by Aero-Carlsen. Prices in Germany are about $3,500 for the 65-hp model and $3,800 for the 90-hp model.

NORWAY Right: The Larson *Special* is Norway's first experimental private aircraft to receive a permit to fly. Designed and built by Capt. Carl L. Larson, chief pilot of Braathens, the *Special* is a single-place craft of all-metal construction with tricycle gear. Power plant is a 90-hp Continental with a Norwegian wooden prop, soon to be replaced with a metal McCauley unit. Cruising speed will then be 150 mph. At present the plane lands at 85, stalls at 60 and has a landing run minimum of 425 ft. Empty weight is 660 lbs., gross 900. The plane eventually will have 15-gal. wingtip fuel tanks.

JAPAN Left: Made of glass fiber plastic, the Tohi D-A was jointly manufactured by the Nitto Spinning Company, the Tokyo Light Plane Laboratory, and the aeronautical research section of Tokyo University. Span is about 43 ft., length 24 ft.; gross weight 680 lbs.; stalling speed 30 mph; aspect ratio 10... Piloted by Isamu Oda, a veteran glider pilot, the glider underwent numerous tests at the Fujisawa airfield near Yokohama.

INTERNATIONAL Right: Although built in Japan by the New Tachikawa Aircraft Co., Ltd., near Tokyo, the R-HM is a development of the HM-130 "Pou du Ciel" or *Flying Flea* designed by the Frenchman Henri Mignet and produced in Brazil by Avioes Mignet do Brasil. A two-place side-by-side plane, it is powered by a 90-hp Continental. Its unusual wing configuration is termed a tandem monoplane or heavily-staggered biplane. The wings are shown here folded for storage. Top speed is 100 mph, cruise 75, range 295 miles, gross weight 1,422 lbs., empty weight 910. Span is 26 ft., length 16 ft. Shin Tachikawa is planning to mass-produce the R-HM for export to Africa, South America and other foreign areas.

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Georgia — Southern Airways Co., Atlanta

Illinois — Butler Airplane Sales, Chicago

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Iowa — Elliott Flying Service, Davenport; Graham Flying Service, Sioux City

Kansas — Aircraftco, Inc., Wichita; Topeka Aircraft Sales & Service, Topeka

Louisiana — Currey Sanders Aircraft Company, Inc., Shreveport; Baton Rouge Aircraft, Inc., Baton Rouge

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New Jersey — Atlantic Aviation Corp., Teterboro

New Mexico — Cutter-Carr Flying Service, Inc., Albuquerque

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Tennessee — Capitol Air Sales, Inc., Nashville; Memphis Aero Corp., Memphis

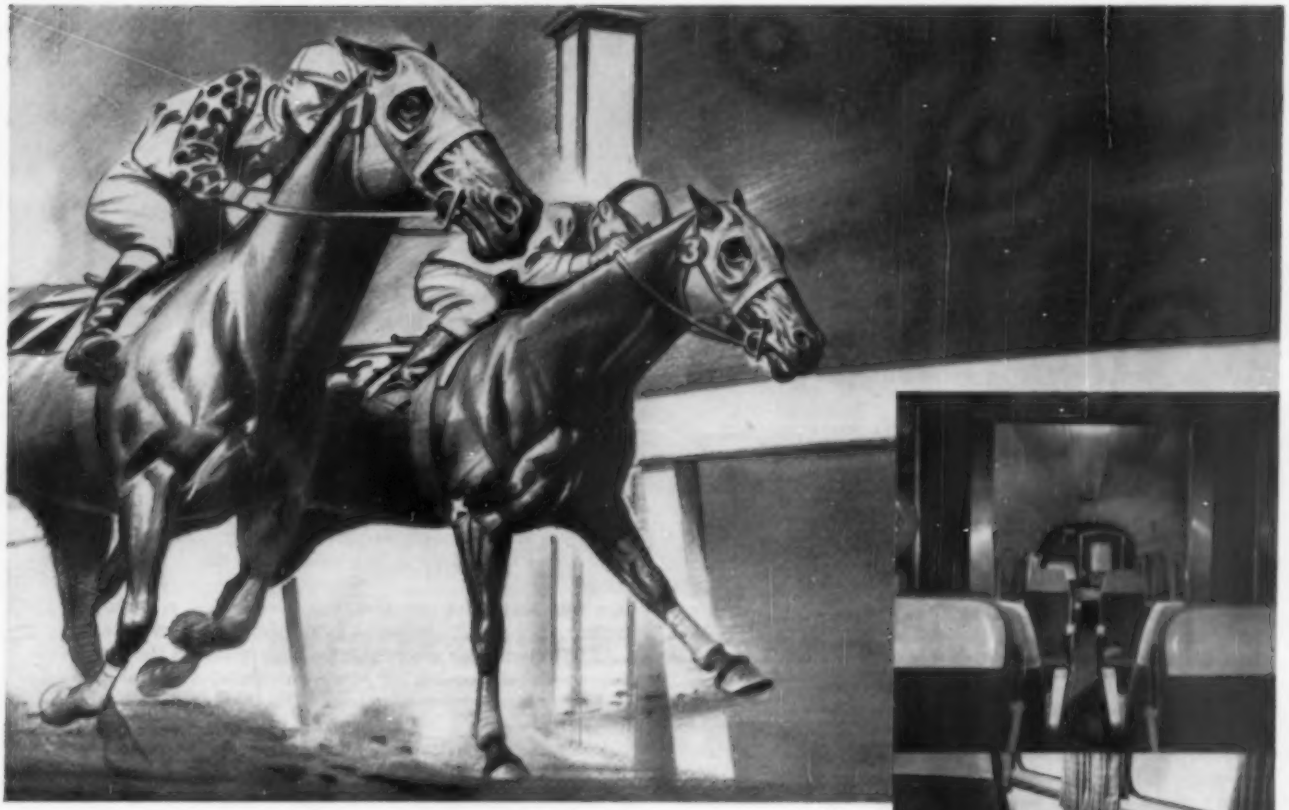
Texas — Tradewind Airport Corp., Amarillo; J. R. Gray Co., Inc., Dallas; J. D. Reed Co., Inc., Houston; Alamo Aviation, Inc., San Antonio

Utah — Kemp & Kelsey Airservice, Inc., Salt Lake City

Virginia — Piedmont Aviation, Inc., Norfolk

Washington — Flightcraft, Inc., Seattle

Wisconsin — Anderson Air Activities, Milwaukee



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LOAD OR OVERLOAD?

Some day your life may depend on it.

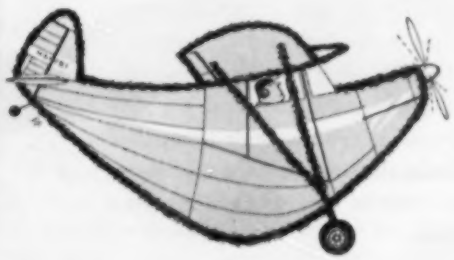
WAYNE BROWN

THE RUNWAY WAS BEHIND us, 'most all of it. And we were doing 70 mph into a clump of trees —still on the ground.

It was past time to think about the load we were carrying, or to recall that I had taken off with only half a load of gas on the first leg of the flight, from a mile-long runway. Now we had a 3,000 foot strip, and a full load of gas, plus my assistant's 200 pounds, two chutes, two boxes of tools, a collapsible stretcher, two suitcases and an extra carburetor for the Stinson *Station Wagon* we were flying. We hadn't weighed any of the stuff. We didn't know within a hundred pounds of how much load we had.

Right then, we gladly would have traded all that paraphernalia for the 50 feet of altitude we needed to clear the trees looming beyond the runway.

We looked at each other in grim silence. There was nothing to say that both of us didn't know. Then the ship ran out of runway. The wheels struck a small ridge, and we bounced into the air. I "petted" the controls to keep the plane from mushing back. It settled a few feet, then labored into an almost imperceptible climb, while the trees came up on us at an alarming rate. It still seemed certain we would hit them when we were a hundred feet away. And indeed the wheels eventually brushed through the upper branches as we hung on the ragged edge of a stall. Then I eased the control column forward and flew a mile before we picked up safe flying speed.



I had only a few hundred hours at the time, but that's no excuse. We both knew better. We had just grown careless about our load factor, and that carelessness almost cost us a good airplane.

Of course, no one will intentionally load more weight into a plane than it will carry, but there are many angles to consider in figuring load or overload. What may be an acceptable load under certain conditions may be dangerous overload under other conditions.

Such was the case with a pilot friend of mine. He was employed by a concern which manufactured special accessories for oil drilling. The accessories were small, but when needed, were needed in jig time. The company bought several planes, and hired technicians who were also commercial pilots. When their products were in emergency demand at a distant spot, they simply loaded a plane and flew them to the location of the drilling operation.

On this particular occasion, the pilot loaded a specified number of the units in his ship and ferried them several hundred miles. For the return trip, he reloaded the plane with an equal number of worn-out units, a reasonable act under most circumstances. He was killed in the crash that resulted when he tried to take off with the load before daylight next morning. He had plenty of runway, but a light frost had settled during the night. Although ordinarily the frost would have meant little, his load factor was such that even the slightest of frost gave him an overload under the circumstances.

Then there was the case of the Mississippi duster pilot who had been flying 800-pound loads of dust for three hours prior to breakfast. That was nine o'clock in the morning. It took him an hour to finish his meal. When he resumed flying, he ran out of runway with the 800 pounds he had left in the hopper when he stopped to eat. In one hour, the temperature had risen enough and the pressure density had changed sufficiently to transform a safe load into an overload. The Stearman wrapped around a telephone pole and was a total loss. Fortunately, the pilot crawled out without a scratch but he was $3,000 poorer than he had been before breakfast.

In Venezuela one day, a companion duster pilot of mine loaded only 600 pounds into a Stearman for take-off on a 1,400 foot strip, from which all of us had flown regularly with as much as 900 pounds. This time the Stearman ate up the strip and sheared off all four wing panels in a mango tree 100 yards from the end of it, leaving fuselage, pilot and dust making like an eagle in the upper branches, 90 feet above terra firma. The cause was a thunderstorm that hovered about a mile from the field—nothing new in the tropics as there is always one around somewhere during the rainy season. This time it happened to be moving in the wrong direction, and the currents which circle the cumulo-nimbus vertically were causing a terrific downdraft at the end of the runway.

Most of the overload conditions with which I am personally acquainted involve crop- (*Continued on page 74*)

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MORE PEOPLE HAVE BOUGHT PIPERS THAN ANY OTHER PLANE IN THE WORLD

I learned about flying from that !

Brig. Gen. Robert L. Scott, Jr. is Director of Information Services for the Air Force. His long and varied flying career ranges from flying air mail in 1934 to commanding the 36th Fighter-Bomber Wing (jet) at Furstenfeldbruck, Germany, in 1949.

The T-Bird had just made a normal take-off. Then it happened, like a knife to my heart!

By ROBERT L. SCOTT, JR.

FATE OFTEN FORGIVES a man who errs on the ground. There can be forgiveness on the sea. But in the air, odds are high that a simple mistake can be final—especially so on the wings of a jet. There was a time when fledgling man could dig into the blue with more courage than care—with time, precious time to think, plan and act. But today things have changed. Technology has telescoped time and space. The jet has translated whole numbers into dangerous fractions. The pilot's best friend has become that inner voice which urges him to be a "nit-picker"—a master of annoying detail.

I've logged 17,000 flying hours mostly in single-seater fighters. I've bored a hole through some four million miles of sky, so it should follow that somewhere along the line I resolved to heed that little voice. But did I? And that's the wonder of this flying game—a man never learns it all and, when he does, chances are he will be carried out feet first. In the world of the flier there's something new every day—something to unlearn—something more to learn, which brings me to my story.

A *T-Bird* is a jet trainer; a T-33 in Air Force flight manuals. It's a two-seater used for instrument instruction and simple to fly. It climbs above 40,000 feet and clocks mighty close to 600 mph—Mach .82. But, like any other jet, it requires the treatment given a loaded pistol. Oh sure, as jets go, it's a safe and stable old man's airplane but it can be unforgiving.

One day recently I leaped off the northwest runway at Andrews AFB near Washington in a *T-Bird* aimed for California. I calculated an ETA between six and seven hours. En route I made a mistake and almost didn't make an ETA at all.

First stop, Scott AFB, (St. Louis) two hours out of Washington. They treated me mighty well at Scott—let me taxi right up to operations. Even parked me in a VIP slot so I'd have a short walk to the warm operations building, and my *T-Bird* would get quick refueling. No waiting planned. In a few minutes I'd have 814 gallons of JP-4 and be off for Amarillo, Phoenix and Burbank. It was bitter cold when I raised the canopy. I could feel the icy wind slice across the back of my neck and almost smell the delightful hot coffee inside the ops snack-bar.

But the odor of JP-4 (jet fuel) called me back to reality. Cold or no cold, I determined to watch the reservicing. I had to be sure each of the seven tanks was full—that each of the seven critical caps were screwed back tightly—that nobody would put hydraulic fluid in a fuel tank or oil in the hydraulic tank. I had to set the totalizer myself and keep an eye on the oil tank filler cap located near the plenum chamber. And I had better not see anyone try to open either of the two gunnery access doors in the process. Nothing can be taken for granted around an airplane, especially a jet, I said to myself.

So I shivered in the cold and argued with the airdrome officer who insisted on my personal comfort over a hot cup of coffee inside. I watched my tanks fill to the brim—watched seven caps secured—guarded my gunnery access doors like a hawk. These doors are the big curved dural things on each side of the nose section. They look like riveted metal clam shells. Hinged at the top, they have three bronze fittings to lock them shut, and are opened only when it is necessary to ground-service the battery, the guns, the radio compass and various electronic gear. But all these things were working well in my *T-Bird* and there was no need to open them this stop. Like I said, these doors are critical. Should either one open in flight to full extension, the *Bird* would have another rudder, more or less, and in the wrong place. Aerodynamically, this would trim the ship into permanent nose down attitude. These doors could turn into hole-diggers. Then again, if the force of the wind ripped them off, they could easily clip the rudder, vertical fin or elevator. There have been cases where they have sliced off an entire tail section. Yes, this was a critical checkpoint all right, and one reason why the man behind the stick should act like a nit-picker around his jet, even if parked in a VIP slot.

But that cold windy day, I goofed. Oh sure, somebody else goofed too. However, it was my life and my plane and in a fighter a man is all alone. The monkey's on *his* back. There is no time or place for excuse.

Scott operations had my clearance ready when finally I jogged inside. I merely had to sign it. Amarillo lay 680 miles away; flight plan—35,000 feet; upper air—hundred-knot headwind; ETA, 1:40 hours. (*Continued on page* 69)

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*f.a.f. Conway, Pa.

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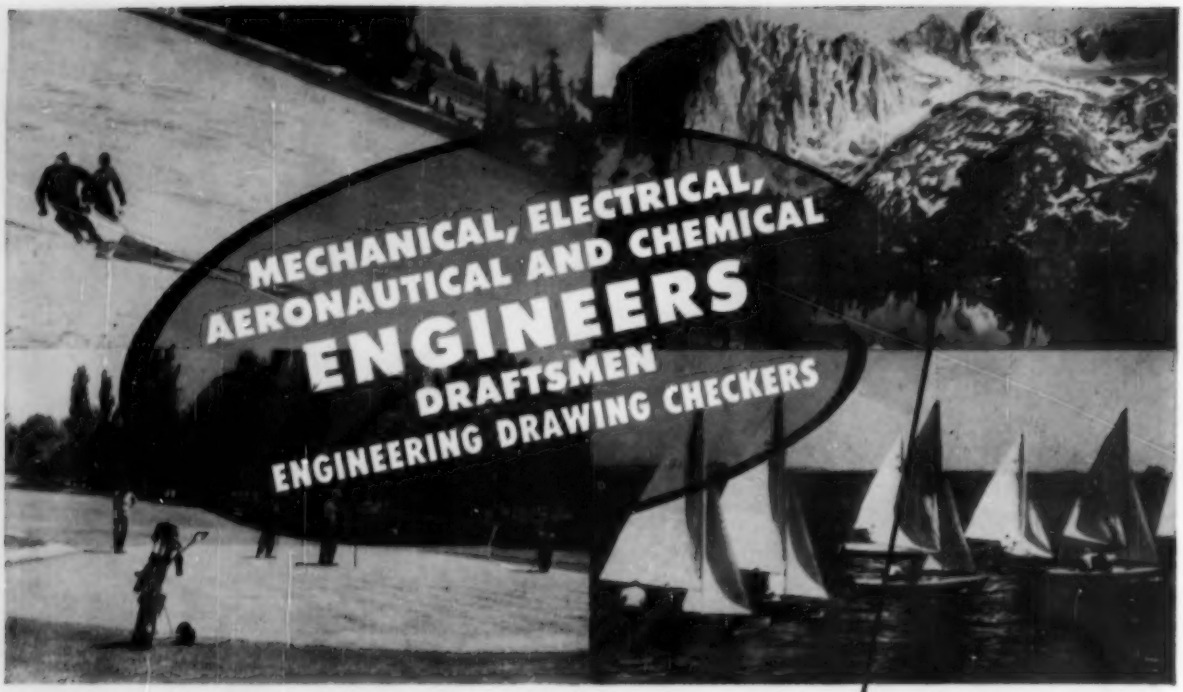

Aerojet-General, America's leader in rocket propulsion, announces the activation of its new Liquid Rocket Plant near Sacramento, California. Devoted to research, design, development and manufacture of large liquid-propellant rocket engines, the new plant is the world's largest industrial establishment of its kind.

Operations are starting now on a permanent basis. Unparalleled "ground-floor" opportunities exist for engineering personnel and draftsmen at all levels of experience.

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For further information please write or call the *Personnel Department, Liquid Rocket Plant, Aerojet-General Corp., Sacramento, Calif.* Your inquiry will receive immediate, confidential attention.

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The Coanda Story

(Continued from page 33)

vanced Aeronautic Study. Shortly thereafter, he began his work on the world's first jet aircraft.

From the start, Coanda decided to eliminate the propeller, which he felt had limited potential. His initial calculations indicated to him that he could obtain far greater efficiency by use of a type of aircraft powerplant which he called the "turbo-propulsor."

But let the Professor tell his own story: "From the beginning, I wanted to do away with the limitations of current thinking—that a propeller was indispensable. All airplanes operated on the principle of a kite, and had a propeller either to drag or to push them by motor power through the opposing medium of the atmosphere.

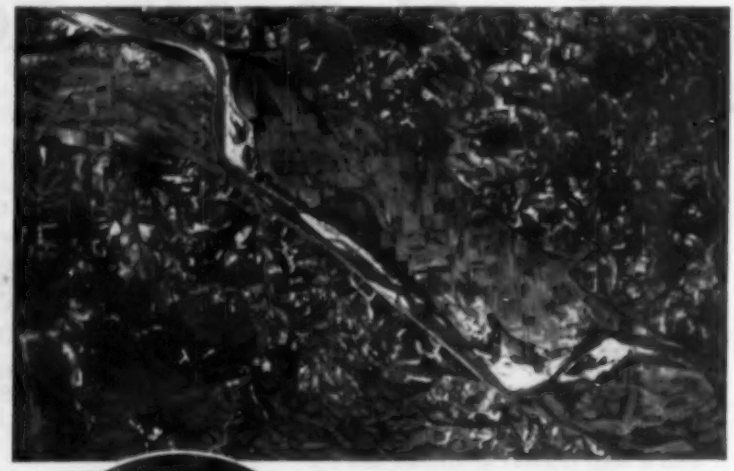
"I believed a more effective motor fence could be utilized by creating a vacuum in front of, or above the aircraft, into which the plane would be drawn. This is a natural phenomenon, demonstrated every time a tornado ravages the countryside.

"I had asked my friend, Clerget, to make me an especially light engine, for which I had given him general specifications. Clerget's inventive genius, in just a few months time, gave me a motor which weighed a mere 2.8 pounds per horsepower, a veritable achievement for those times. It was my intention to use the turbo-propulsor to thrust the air through a circular vent encircling the motor. I intended to inject fuel into the air stream, which would be ignited by the exhaust gases also channeled through the same circular vent. I hoped this would obtain the jet reaction desired, by utilizing the total fuel value of the gas. The exhaust of the ignited gases was directed below and to either side of the fuselage. I armored all sensitive parts with asbestos, and during static testing, failed to note any actual flame at the propulsor exhaust outlet.

"I think a word of explanation is due the special wing design of my jet plane. In order to produce a single piece wing with a plywood-type covering, I lined a large plaster mold with sheets of wood which were covered with glue. To make those sheets of wood take the mold form, I lined them with a layer of celluloid, and then forced hot oil under pressure into the mold. Then I let all the materials cool under constant pressure. But when the time came to remove the wings from the mold after evacuating the oil, I found it impossible to remove the celluloid. It had become so solidly united to the wood that the whole interior of the wing was lined with celluloid.

"The airplane was of revolutionary form. It had a fuselage of slender silhouette, with fuel tanks in the wings. The tail was of delta design, and I even had a retractable landing gear. Most important in the wing design was a slotted flap, which would greatly increase the lift of the airplane. The jet of air was discharged along the upper surface of

(Continued on page 54)



SUPERSONIC PHOTO

TAKEN at an altitude of 45,000 feet by an RF-101A *Voodoo*, this photo is believed to be the first supersonic picture ever obtained by a photo-reconnaissance airplane. It was taken with the nose camera pointing straight down. The Missouri can be seen zig-zagging through the picture. A small section has been enlarged two times in the circle at the left. Can you locate it in the large photo?

a letter from Daddy

TO: JOAN REED

Dear Joanie:

Congratulations from the proudest papa on earth! So at last you're on the stage, treading the boards in the paths of other Great Ladies of the Legitimate Theater, like Cornell, Hayes, and Barrymore! Remember now, honey, on opening night just forget yourself completely, smooth out your costume, and let the character you portray come shining through.

Since you're going to be famous, you may not be interested in news about your daddy and his business flyin' machine—like, for instance, Southwest Airmotive's new pocket-size "program" detailing flat labor rates for the overhaul of engines, accessories, and instruments. As a kind of bonus for us old geezers, it even includes photos of SAC's beautiful ad models—which reminds me, I'm glad you're not the cheesecake type, even if you are 22, 5'6", 118 lbs., blue-eyed and blonde. For nearly a quarter-century, Southwest has pioneered many great things—including flat labor rates—and this little SAC booklet is a useful reminder that the company remains No. 1 in top-quality craftsmanship at money-saving prices. They'll send a copy to any pilot or owner on request, and I'll have 'em mail one to you just for fun.

Good luck—and remember grandpa and grandma were in the theater, too. Only one Black Sheep—your Uncle Hugo who was in burlesque, but we don't mention him!

Love,

Daddy

SOUTHWEST AIRMOTIVE CO. • LOVE FIELD • DALLAS, TEXAS

You can **WIN** *this Piper Tri-Pacer .*

HERE'S THE PIPER TRI-PACER that will be awarded to an AOPA member. Any member participating in the contest has an opportunity to win.

The TRI-PACER is packed with performance—safety, economy and flying ease—all are engineered into the new, more spacious 1956 TRI-PACER. With 150 horsepower this four-place airplane has outstanding small field performance, cruises over 130 mph at optimum altitude.

Its flying ease is unmatched. Its husky tricycle landing gear, proven in over five years of daily use by thousands of Tri-Pacers, takes the skill out of landings, even with cross-wind conditions. Its simplified controls with inter-connected rudder and ailerons, eliminate the need for coordination.

. . . in AOPA's

CONTEST INFORMATION

This partial list of AOPA services may give you a clue as to "Why you joined AOPA!"

If you have soloed or own an aircraft you are eligible for membership and can don the AOPA wings now proudly worn by 50,000 of the world's most active pilots

THE CHAMPION DELUXE TRAVELER will be awarded to an individual joining AOPA between January 1, 1956 and June 30, 1956.

It's simple—when filling in the membership application below, include a statement of 25 words or less on "Why I Joined AOPA".

The new member submitting the best statement, based upon originality and sincerity will be presented with the fine new CHAMPION.

So, affiliate yourself with the 50,000 pilots who agree that AOPA membership is one of the best aviation investments they have ever made. Join now!—and you may be the winner of the fine, new 1956 CHAMPION DELUXE TRAVELER.

THE PIPER TRI-PACER that will be awarded to an AOPA member. Any member participating in the contest has an opportunity to win it.

New members joining AOPA are also eligible to compete for THE PIPER TRI-PACER. Immediately upon receipt of your membership application, you will be sent your membership credentials and complete details on the TRI-PACER Contest.

Your membership in AOPA means that your flying activities will become SAFER—LESS EXPENSIVE—MORE USEFUL . . . and, you will be adding your weight to the AOPA program for the advancement of civil aviation.

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SEE CONTEST DETAILS ON THE OPPOSITE PAGE

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Aircraft Engine service, overhaul, modification, replacement

Propeller service, overhaul, modification, replacement

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(Continued from page 50)

the flap, and was deflected downward, away from the slot's flow axis. Thus the airflow through the slot stuck to the flap and contributed to the high lift.

"In 1910, the wind tunnel was unknown but I found a way to test the design. I mounted the wings on a railroad locomotive and was able to watch their performance in this fashion. Finally, after all the tests were over and the machine assembled, we prepared for the first experiments. In December, we brought the airplane out of its hangar at Issy-les-Moulineaux and, after a bit of coaxing, started the motor.

"I must admit that I was never a very outstanding pilot. I always seemed unable to shake off a vague apprehension and, that morning, in addition to my usual uneasiness, I was rather excited.

"I climbed into the cockpit, accelerated the motor, and felt the power from the jet thrust straining the plane forward. I gave the signal to remove the wheel blocks, and the plane started moving slowly ahead. I had anticipated that I would not attempt to fly today, but would make only ground tests on the small field at Issy-les-Moulineaux.

"The controls seemed too loose to me, so I injected fuel into the turbine. Too much! In a moment I was surrounded by flames! I had to cut back and reduce my power quickly.

"I worked the throttle and the flames subsided. Only then did I have opportunity to lift my head. I saw that the plane had gained speed, and that the walls of the ancient fortifications bordering the field were lunging toward me. I pulled back on the stick, only much too hard.

"In a moment the plane was airborne, lunging upward at a steep angle. I was flying . . . I felt the plane tipping . . . then slipping down on one wing.

"Instinctively, I cut the gas with my left hand and the jet fuel with my right. The next thing I knew, I found myself thrown free of the plane, which slowly came down, and burst into flames. It was impossible to determine from the wreckage whether the celluloid or the fuel was the cause of the fire.

"But the test was over. I had flown the first jet airplane."

Professor Coanda, despite his bruises, was anxious to begin work at once on a second engine and aircraft. Inexperience with the new propulsor and an unfortunate set of testing circumstances had caused the loss of the initial machine. However, the Professor's funds were exhausted. He had spent more than a million francs of his own money on the project, and could not secure backing. The world had to wait an additional 29 years before another jet airplane took to the air.

During World War I, Professor Coanda applied himself to development of French aviation and allied fields. Many new inventions were fostered, not least of which was the recoil-less cannon designed specifically for Nungesser's fighter.

Coanda, since the end of the First World War, has devoted his attention to perfecting several aeronautical theories which bid fair to revolutionize our concept of the airplane, and its application for personal and commercial use. At this time, in France, he is working on a new personal aircraft design which is a true disc. Imagine—a one to four-place aircraft, of disc configuration, with an empty weight of less than 900 pounds; *a powerplant with not a single moving part;* a cruising speed of 300 mph; and a range, at this speed, of 1,000 miles. Take-off run for Coanda's new aircraft? *None!* It is capable of vertical ascent, descent, and hovering.

If Professor Coanda's estimates are correct—and there is no reason to believe he has erred in his figures—his airplane will be within the price range of the average American automobile, from $2,500 to $4,000. He began research on this newest concept of propulsion, which led to his current design (the correct description is *Lenticular Aerodyne*) in 1930. A student of weather, he saw in the phenomenon of tornados and cyclones a power simile for aircraft.

As Professor Coanda puts it: "Look at a tornado. Its characteristics include a certain kind of wave front, a form of vacuum, with power great enough to ruin entire towns. An understanding of this effect—a vacuum which creates great pressure and lifting power—is what started my research on what has become known as the 'Coanda Effect.'

"Now, most propulsion, such as that effected by propellers, turbojets, and so on, is what I call two-dimensional propulsion. The most important feature of the 'Coanda Effect' is that it is a *three*-dimensional propulsion.

"Take the aircraft wing. In motion the lifting power is derived from vacuum effect on the upper surface, and the greater pressure below. What I wanted to do was to produce the same vacuum, but in circular motion.

"I wanted the vacuum above the surface, and under high pressure, to be derived from a circular motion of gases.

"In 1932, when I was first experimenting with this circular effect, I was pro-

(Continued on page 56)

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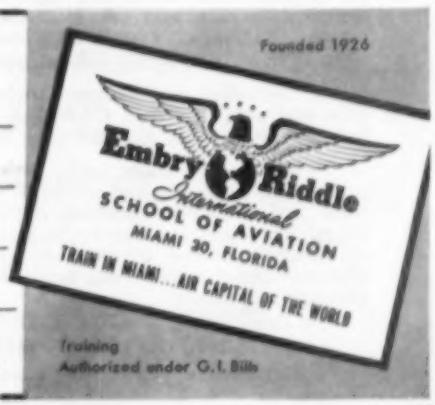

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TRANS WORLD AIRLINES, INC.
Municipal Airport — Kansas City, Missouri

(Continued from page 54)

ducing as high as six tons of lifting power per square yard above a wing. I had created an enormous vacuum above the wing through a propulsion system which, to say the least, was clearly different from anything which had been previously attempted.

"There were a good number of aerodynamicists and engineers who had heard about my experiments, and who wanted to know more. My claims, to say the least, were astonishing and they demanded a detailed paper theory about the entire affair. I had no interest in elaborately-prepared theories; I was more concerned with working results. I had no time to prepare papers for them. So, they wouldn't listen.

"In 1938 I attended an assembly of the world's leading engineers and aerodynamicists. The people present discussed, among other things, new methods of propulsion, and my friends inquired why I hadn't made a fuss about my ideas. Let me clear up that matter once and for all. Since nobody asked me to address the group, I didn't bother. I had no intention of going to a lot of trouble to shout in anyone's ear.

"I saw many remarkable ideas at this convention. But every single man present was basing his work on the old and proven theories. They were trying to improve the old, instead of striking out in a new direction. They were afraid of being 'different'.

"Now I am a mechanical-minded man, an engineer, and I have been a mechanical engineer from the very start of my career. I am close to it, intimate with it, I *understand* mechanical engineering. And that is why I hate it.

"Take our modern aircraft. Things break too easy. There are too many parts, too many things which can go wrong. And when they do, disaster is the result. Just before the last war, I found myself working on a new line of thought. In things mechanical, I reasoned, metal can be brought from its familiar state of a solid to something molten, then to liquid, and finally to a gas.

"Well, why not *start* with gas? Why go through the whole process? Why use the piston engine, which is terribly wasteful with all its heat and friction and thousands of moving parts? Even the turbojet, with its compressors, is too much a deviation from the engine we need. I wanted a machine, a propulsion unit, *where nothing is moving.*

"Naturally, no one agreed with me. This, of course, failed to be of annoyance. I have always been, and will continue to be, an individualist. I don't like to run with the pack, just because everyone has always done so, and because it is the proper thing to do.

"I was well into the new project when —war. With the Germans, well . . . I stopped all my work until 1945."

After the liberation of Paris, Professor Coanda met Colonel Valentine, U. S. Air Attaché in the French capitol. He and other officers were sufficiently impressed with Coanda's work to persuade the Professor to leave for the United States, and discuss his work with officials in the

Army Air Force. Letters of introduction were thrust in profusion upon Coanda, and he departed for Wright Field, the vital air development center in Ohio.

At Wright Field, the Professor was accorded the welcome of an honored guest. The engineers listened to Coanda, but once he expounded his concepts of wave fronts and aerodynes, he met a sea of familiar faces wreathed in skepticism and disbelief. It was an old story. Coanda was now convinced of the futility of trying to prove that the future in the air lay not in smashing our way through the air ocean by brute strength, but in learning more intimately the nature of movement within the air, and by using to our advantage this knowledge in new designs.

(One example of this "breakaway" from orthodox design is the "area rule" developed by an NACA scientist which produced the so-called "coke bottle" fuselage in the Grumman F11F *Tiger*, the 1,050 mph Chance Vought F8U *Crusader*, and the Convair F-102A. By allowing the air to move along the path of least resistance at the latter half of the fuselage, the F-102A, an airplane which could not attain supersonic speeds and was likely to be abandoned by the Air Force as a failure, suddenly became supersonic even in climbs, *and without an increase in power.*)

Again, Professor Coanda: "It was obvious that I would have to do the job myself. I had a specific project in mind—to show that an airplane, whose propulsion would be derived without a single moving part, would outperform every other aerial machine of comparable size and weight, in the world.

"First, the engine. In my initial experiments I modified the exhaust system of an ordinary piston engine with what I called a 'depressor.' Without touching the engine at all, I increased its power by exactly 53.5 per cent! But the manufacturer rejected the depressor on the ground that it was too complicated, that, if he wanted more power, he would add more cylinders to his present engine. His rejection was not entirely unjustified, for the depressor posed serious casting problems as a production item.

"To come to the present, I am well at work on the new machine, the *lenticular aerodyne*. It is for personal use, designed to hold two people comfortably, or a maximum of four, without baggage. I believe I can produce this new aircraft at the price of the average American motor car.

"The airplane does not, in the sense that we understand it, have any engine at all. The machine functions as a gyroscope. In the air, it maintains a compass' position. That is, it always points to the north.

"Imagine the machine—it is a perfect disc, and in its center is the passenger compartment, with a raised plastic canopy for visibility. Between the edge of the circular wing, and the passenger compartment, there are four large circular openings. Or, if you will, call them depressions in the upper wing surface.

"Each of these openings has along its

(Continued on page 58)

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(Continued from page 57)

edge a series of small gaps, through which flame is ejected from a nozzle under high pressure. It is almost like a blowtorch. When the flame moves out between the gap, it is directed away from a funnel intake. This causes a loss of pressure in the funnel area, drawing in a steady flow of air, which is ignited by the combination of air ram pressure and the flame. The flame from the 'blowtorch' we may think of as a continuous sparkplug.

"The burning gases are then blown outward, along the slot. However—instead of letting all the air drawn along with the flame move in the same direction, a baffle on one side of the opening causes the flame to 'bend' in that direction, thus creating a partial vacuum. The greater the force of the flame as it is ejected from the nozzle toward the baffle, the greater the vacuum.

"Thus there is created, along the edges of each of the four circular openings atop the wing disc, a very strong vacuum. Because of the inward movement of air to feed this lowered pressure, the entire circular edge of the disc wing is a vacuum. And, of course, there is corresponding lift from beneath.

"The machine, once it is airborne, never changes its 'compass heading.' It always points to the north, just like a magnetic compass. It is kept in balance by a gyroscope in the center of the lower wing, which is air-driven.

"Turning, or changing direction, is accomplished by changing the pressure (or vacuum) on any one or two sides of the machine. Let's say the pilot wishes to execute a 90-degree turn to the right. By moving the controls, he would decrease power on two of the large circular openings by reducing the power of the flame jets, and the machine would veer off in the desired direction. The wing itself would still point north, but the passenger compartment would revolve to face in the new direction of movement.

"Under maximum-speed operation, the entire angle of attack of the machine would change to tilt forward, just as do the blades of a helicopter. In this fashion, the aerodyne would move forward, backward, to the right or to the left, rise and descend vertically, or hover.

"The safety features inherent in this type of performance are too obvious to elaborate in detail. Every pilot knows the advantage of a machine which he can bring to a halt in midair, and then lower slowly and carefully, if he is faced with adverse weather conditions, or is lost and running low on fuel. And, of course, we have not mentioned the elimination of large airports, or the fact that the machine can truly be landed in anyone's back yard."

Professor Coanda said, in closing. "The United States and France have for many years worked together in aviation," he said, "and it is time we resumed our positions as old friends of the air." END

I Change Weather

(Continued from page 25)

sion, it had been agreed that I was to locate a suitable airplane, which would be a P-40. It was to be overhauled and equipped with the necessary devices and instruments in time to begin operation on a California project for which the company was under contract to increase rainfall.

Getting the airplane equipped as they desired developed into a major chore in itself. The P-40 was originally designed around just so many gadgets, and no more. My first consideration after the plane was purchased was the installation of an ash tray. This in itself was no small accomplishment due to lack of space, but somehow, all the equipment previously mentioned was placed in the "last" space available. Subsequent flight tests showed only minor alterations were needed and, a few days before the beginning of the contract, the plane was ready for operation.

During the time the plane was being rebuilt and outfitted, I viewed the whole idea with some misgiving. First, it didn't seem likely that a few ounces of dry ice, or a few grams of silver iodide emanating from the rather puny appearing heat generator mounted on the side of the plane, could have any effect on a towering 35,000-foot thunderstorm. Second, I didn't think poking my nose into such storms, with a comparatively tiny plane, was a very sensible idea. (Frankly, the second still isn't appealing.) The first thing any pilot is taught about weather flying is to avoid, if possible, any and all thunderstorms. However, I was employed to fulfill this purpose, and was also curious to learn if anything could actually be accomplished.

My first flight experience was not too impressive. I learned that only at times are the results of cloud seeding visually spectacular. "Let's go, boy," John telephoned cheerily one windy rainy night. "There is a front moving in, and it looks like we'll have a lot of weather to play with."

I strapped on the P-40 and took off. Climbing through the overcast to 19,000 feet, I contacted John by radio and advised him that I was ready to begin operation.

"You have a moderate cell 35 degrees and 7 miles from your present position, 23 Nectar. Go hit it," or, "18 miles at 205 degrees," and so on for the next hour I was vectored from the radar trailer. It would further advise me as to when I was entering a storm cell so that I might start the seeding run. This particular bit of information, however, was wasted effort, as the sometimes violent buffeting of the plane was sufficient evidence of this fact. These cells were all seeded with silver iodide—one second on, three seconds off. Flying the plane under these turbulent conditions, manipulating the seeding equipment, maintaining contact with the ground radio, and keeping a check on navigation kept me sufficiently busy to solve any problems I may have had on excess weight.

Except in cases where a return run was

(Continued on page 60)

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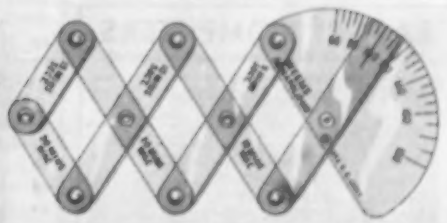

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(Continued from page 59)

made through a cloud after seeding, I had no way of observing the results, other than information received by radio that the radar scope showed the seeded cells building in intensity and an increase in precipitation. After a few more runs, the storm front passed and John radioed me to go on home to bed.

It was during my second mission that I developed the first spark of confidence in man's ability to change the structure of clouds. We had been seeding isolated rainstorms over our target area, the area over which the company had contracted to increase rainfall, during the late afternoon. Nearing completion of the first flight of the afternoon, I noticed a large cloud drifting slowly toward the airport where I intended to land for gas. This cloud definitely had no precipitation, and I advised the radar station one run would be made through it at 21,000 feet before landing in the then clear weather at the airport. The run was made, and I peeled off and put the plane into a steep dive for the ground. During the descent, the cloud drifted over the airport. As I entered the downwind leg, a slight drizzle started, and by the time the plane was lined up with the runway, moderate to heavy rain reduced my visibility to less than one-half mile. As a result, a pull-up was made, and I circled the field until the rain passed.

All this from less than a teacupful of silver iodide!

After some thought, I finally decided this could be a coincidence, but after a dozen or more similar instances that could be observed visually, I finally became convinced that seeding did work. It didn't especially flatter my bosses when I informed them of this.

"Thanks," said Bert O'Hanlon dryly, "but what we're interested in learning is the 'how and why' of it—how we can gain more accurate control of it by eliminating the guesswork."

For the next few months, we continued the work of increasing rain, and began an evaluation to determine the exact effectiveness of the operation. It is pretty well agreed in meteorological circles that a program using the outdated method of seeding with ground generators only, can *generally* increase rain by 20-25 per cent in any given area over an extended period. Since O'Hanlon and Battle were pioneering the entirely new concept of seeding with radar, aircraft, and low power ground generators, they were interested in learning what increase above the *standard increase* had been obtained.

The results were quite surprising. To begin with, studies of motion picture film of the scope in the radar trailer disclosed that, contrary to the belief of many outstanding meteorologists, the effects of seeding are definitely localized. In most cases, the precipitation induced by artificial seeding lasts for only the period of time it takes a cloud to move from 20 to 30 miles. After this time, the cloud returns to its natural processes, and can be re-seeded to gain the same effects for an equal additional distance. This practice of re-seeding enables the operator to double the precipitation he would normally have received through the older method. In cases where the cells moved in a path out of range of the ground generators, the plane would accomplish that seeding.

It is commonly assumed that rain falls in a continuous belt covering great distances during frontal conditions. Actually, such a belt is made up of numerous rain cells, which are easily identified and clearly defined on weather radar. Consequently, efficient rain increasing can now be accomplished by seeding each cell individually, then tracking its development and dissipation, and re-seeding when necessary.

Perhaps the most pertinent point discovered through this research was that indiscriminate seeding of a general storm belt as such, can result in overseeding, which tends to reduce natural rain to a light drizzle. This can be disastrous to power companies, farm groups, irrigation districts, and others who contract with companies such as ours for the purpose of rain increasing. With the use of radar, it is possible to stop seeding the instant that a cloud shows its peak of growth has been reached, without risk of defeating our purpose through overseeding.

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Available either as a completed aircraft or in conversion kit form, the door modification is CAA approved. Price for the complete aircraft is $3,000, price varying somewhat depending on condition of aircraft and equipment installed. Conversion kits range from $175 to $275, depending on whether the customer wants merely the approved machined parts or a kit complete with the metal door. Kits include CAA approved forms, which are protected by copyright, and instructions enabling an A & E to make the conversion in about two days.

The same general principles of individual cell tracking and seeding permit almost 100 per cent control of hailstorms which each year wreak havoc in many farm areas. Reducing these violent storms to a mild drizzle has been a comparatively easy task. Such storms move extremely fast, and are spotted by radar at about 90 miles before they enter the target area. When they are sighted, strategically located high-power ground generators are turned on, and I am called into the air and vectored to the general area. On approaching, the airplane radar is brought into operation, to insure accurate penetration of the storm center. A seeding run is then begun, using an exceptionally strong solution of chemical. Depending on the cloud structure, the first run may be over, under, or directly through it. The run through the cloud is the one that frequently makes me consider the advantages of a future in other pursuits. However, within seconds after seeding, an amazing change in the complete cloud structure will take place. The hail stops completely. In some cases, the cloud top, which has the most violent air currents, will flatten out and the storm moves harmlessly over the target area. This I see in each hailstorm I have seeded, and am repeatedly amazed that such a thing can actually be done.

The principles which accomplish this are simple. Each cloud is made up of water droplets. To fall as rain, thousands of these droplets must form around a nucleus, usually a dust particle, until its weight is sufficient to fall to the ground. Cloud seeding is simply introducing more nuclei, thus creating more rain drops. In over-seeding, a much greater proportion of nuclei than needed are brought into the cloud, thus creating many very small rain drops, too light to fall from the cloud. The nuclei introduced artificially is generally the silver iodide crystal, which bears a close resemblance to the ones normally provided by nature.

Scientists and other highly qualified specialists in meteorology have offered varying opinions that cloud seeding will or will not work. Not being a student of this science, I cannot argue with the theories of the doubters. But I can say, without knowing scientifically why, that when I release a scant handful of dry ice into a violent hailstorm, the violence diminishes and the hail stops falling. And when a small portion of silver iodide is released, a comparatively placid rain storm can suddenly grow into a deluge.

As an observer of practical results, rather than a student of theory, I think man is on the threshold of control of weather to suit his needs. It is within his reach to give the farmer ample rain and protection from hail; and to assure power companies of sufficient snow pack in mountainous areas. He will find it a simple task to stop snowstorms which paralyze traffic in major cities; and to alleviate the constant and growing threat of water shortages.

For any who question this, one flight through a thunderstorm, during which the fact of cloud seeding is demonstrated, would dispel all doubt. And, quite possibly, add a few gray hairs. END

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SEE PAGE 55 FOR ADDITIONAL DETAILS

Trends in Air Transport

(Continued from page 29)

DC-4's which were under construction, were delivered to the Air Force in 1942, and after a series of modifications, including fuselage tanks, cargo floors, fittings, and large loading doors, the C-54, as it was redesignated, proved an efficient long-range transport. It had a payload of some 12,000 lbs., as against 5,000 lbs. for the DC-3.

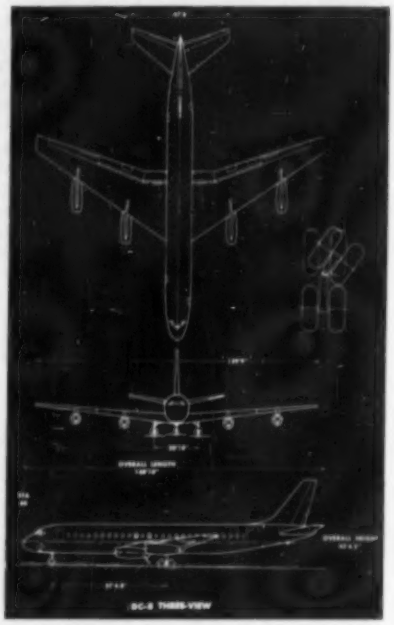
As early as January, 1942, it became evident that even larger transports should be developed. This led to the design and post-war construction of the C-74 and, ultimately, of the C-124—at present the standard heavy cargo transport of the Air Force, with a payload of 50,000 lbs. at medium ranges. The C-124 has now been phased out of production, to make way for its successors. Much larger logistic air carriers, which the state of the art and the availability of power plants now make possible, are in the offing. Quite possibly we shall see a series of transports with specifications varying to meet a variety of logistic requirements.

There has been public discussion of one such airplane with a gross weight of around 400,000 pounds, a 100,000 pound pay load; a cruising speed around 500 mph and a range of, let us say, 1,500 to 3,500 miles. With turbo-prop power, this airplane could function at relatively low cost and on a 'round-the-clock, 'round-the world schedule of freight handling.

A theoretical timetable of cargo movements over a sample route of 1,500 up to 3,500 miles gives an interesting assessment of potential airlift. Published studies indicate that a fleet of only nine such "new concept" transports could do the work of 171 C-54's, or 58 C-124's, at from one-fourth to one-third of the cost involved in operating the older models and in less than half the time.

It may be argued that a 100,000 pound payload airplane is at the mercy of airport installations. This is true only to a rapidly decreasing extent. The foregoing does not necessarily imply a limitation of 100,000 pounds on the payload of our air transport of the future, or that 10,000-foot runways are required but, for the sake of discussion, these units appear to be a logical step in our evolutionary progress away from the old limited "pipeline" concept. Military forces with a high degree of mobility seem to be more and more the future substitute for vulnerable, cumbersome, and ruinously expensive armies.

The importance of new, high-capability, turbo-prop transports, plus the comple-



Upper right: Three views of the DC-8. Right: New features in DC-8 design incorporate two passenger doors on port side for simultaneous loading and unloading while openings on starboard side of fuselage permit servicing. Below: Artist's conception of the DC-8.

mentary turbo-jet refueling in-flight carriers, cannot be over-estimated in any appraisal of our national logistic future.

The interrelated turbo-prop and turbo-jet developments should have a definite long-term impact on civil air transport, but it is perhaps further away than the fast-moving changes in military logistics.

As has always been the case, civil transport will, to a large extent, be dependent upon the military program for development of engines, and for a measure of assistance in establishing quantity prices for aircraft. The type of civil aircraft already in operation, or on order, serve to set the pattern for the next few years. There is no reason to believe that the advent of jet transports about three years hence will violently upset civilian traveling habits. Ultimately, it looks as though we might run into the law of diminishing returns.

Full benefit from greatly increased speeds will be enjoyed by long-distance travellers but they are relatively few in number, even fewer as the journey length increases. The most desirable solution to this apparent dilemma would lie in reducing the cost of air travel appreciably below present levels. This may be achieved by equipping air fleets with two classes of transports similar to those now being prepared for the military, one, whose emphasis is on high speed and long-range, and a second where the emphasis is on low cost.

It seems a reasonable guess that the high-speed plane will be turbo-jet and that the slower, more economical aircraft will have turbo-prop power plants.

The future of air cargo seems bright. It has been thoroughly established that there is almost no limit to its possibilities, when costs per ton-mile can be reduced below present domestic averages—perhaps to below ten cents. As is the case with power plants, the military must take the lead and supply the experience which is a key to all flying progress. I think we may look forward to civil cargo expansion with the same optimism with which we face the entire civil aviation future.

END

Air Force Historical Foundation

(Continued from page 38)

Anderson (Ret), The Air Force Historical Foundation, Maxwell AFB, Ala.

Officers of the Foundation are: President, Maj. Gen. Benjamin D. Foulois (Ret); 1st Vice Pres., Lt. Gen. Idwal H. Edwards (Ret); 2nd Vice Pres., Maj. Alexander P. deSeversky; 3rd Vice Pres., Mr. Gill Robb Wilson; Secretary, Maj. Gen. Dean C. Strother.

The Executive Committee consists of General Edwards (Chairman), Gen. Carl A. Spaatz (Ret) and Lt. Gen. Hubert R. Harmon (Ret).

Any member who has items of historical significance, or writings, manuscripts, incidents or anecdotes, and who feels they may be worth more to the Foundation than hidden away in some trunk, is invited to present them to the Foundation for evaluation and possible retention, exhibition or publication. END

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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is "To make flying more useful, less expensive, safer and more fun."

Headquarters address is Box 5960 Washington 14, D.C. Members also receive a special AOPA edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

180° RATING TO BE FILMED

Continuing its efforts to make private flying safer, the AOPA Foundation, Inc., will film the AOPA 180° Rating as the second in its series of safety motion pictures, J. B. Hartranft, Jr., president of AOPA and the Foundation, has announced.

The 16mm. sound and color movie will be available for showing to flying clubs, groups of pilots, state aeronautics commissions, and others interested in this simple life-saving technique. Distribution of the film will follow the pattern set by the popular *Flight Decision* film produced jointly last year by AOPA Foundation, Inc., and the National Association of State Aviation Officials.

Shooting of the picture was to start in April at Urbana, Ill., at the University of Illinois' Institute of Aviation, which developed 180° Rating curriculum under a grant from the AOPA Foundation. Dr. Leslie A. Bryan, Institute director, and his staff will assist in working out technical details. Film Originals, Inc., of Boise, Id., who filmed *Flight Decision*, will make the picture for the Foundation.

Development of the 180° Rating is considered one of the most significant accomplishments of the Foundation since its founding in 1950. The 180° turn technique, when it becomes widely known and generally practiced, is expected to reduce drastically the number of deaths due to inexperienced pilots inadvertently flying into bad weather.

"We are especially gratified to have received letters from pilots who attest that the saving of their lives and those of their passengers was directly attributable to training they received under the 180° Rating course," Hartranft said.

The AOPA Foundation now is awarding certificates of competency to pilots completing the course. In addition, the Foundation has arranged for an instructors' course to broaden the base of this safety education for pilots. Thirty-two instructors had been awarded AOPA Foundation certificates up to March 1. It is hoped it will not be too long before instructors trained in this vital technique will be available to pilots throughout the United States.

While the motion pictures and the development of the 180° Rating are the latest projects to be sponsored by the Foundation, there are others in the Foundation's continuing drive for increased safety in the air, including the following:

(1) Investigation of the practicability of a new aircraft lighting system to replace flares for emergency night landings.

(2) A study designed to develop a shoulder harness installation, particularly for the front seats of airplanes, which will meet with CAA approval, be low in cost, and simple to install. (It is hoped that a kit can be developed which will allow the installation to be made at any airport by the average mechanic.)

(3) A study of Civil Aeronautics Administration accident reports on fatal crashes involving AOPA members to determine the most common causes of these accidents and make specific recommendations for their correction.

In addition to the above, preliminary work has started on a project to control spiral stability of aircraft by mechanically placing into the wing section an automatic device designed to prevent a pilot from getting into a deadly spiral when he runs into weather beyond his capabilities to handle. Roger Griswold, a foremost expert in boundary layer control techniques, is making this study under an AOPA Foundation grant.

Also, further work is being done in connection with the 180° Rating. The University of Illinois now is making an attempt to provide a limited instrument course to further assist pilots in getting through bad flying weather. An additional grant from the AOPA Foundation is anticipated to enable the completion of this project.

Funds for the AOPA Foundation projects are provided almost entirely by contributions from the 55,000 AOPA members, including the 30-cent annual contribution they make along with their membership dues. A magazine subscription service, in which AOPA'ers subscribe for their favorite magazines through the Foundation, also helps further the work. Some AOPA members who have small refunds due from the Association indicate that the refund should go to the Foundation.

The Foundation has spent about $15,000 on safety projects to date. It has earmarked, or committed, an additional $20,000 for this purpose. Many proposed projects are investigated by the Foundation. Some are not considered feasible and are turned down. Others, while desirable, cannot be undertaken because of the lack of sufficient funds.

Almost no overhead costs are paid from Foundation funds. AOPA has assumed responsibility for all administrative costs. This allows practically all of the Foundation's income to be used in its vital safety work. To date, AOPA Foundation overhead costs total $381.90. The bulk of this amount was used in meeting incorporation expenses.

The Foundation is a non-profit Delaware corporation and is tax-exempt. Its contributors are allowed to deduct the amount of their gifts from their income taxes.

"I think something should be done about these teen-agers and their souped up jalopy planes!"

OVERNIGHT STOP—No. 12

OTIS LODGE

Grand Rapids, Minnesota

FAMED for its good fishing, good food, comfortable quarters and fine hospitality, Otis Lodge and its immaculate grounds literally have grown around its airport. This is its 30th year of operation—20th with an airport. Located 160 miles almost due north of Minneapolis, it is an American plan resort, recommended by Duncan Hines.

Rates including meals, individual cottages, use of boat and golfing privileges are $12 to $15 a day or $80 to $90 a week. Special "Overnight Stop" rate including dinner, cottage, breakfast, is $10 per person—and no landing or tie-down fees. Runways are "fairway-mowed" sod, one being 2,900 feet long by 500 wide, with clear approaches. Beacon, obstruction lights, portable runway lights, and Unicom make it available for night landings. Seaplanes landing on Lake Sisse-bak-wet can taxi up to the Lodge boat landing.

Noted for its prize-winning walleyes and great northern pike, the blue water lake has been continually stocked with pike fry for the last 20 years. The Lodge has 2,000 feet of sand beach clear of weeds. Besides the nine-hole golf course, there are croquet and horseshoe pitching courts and children's playgrounds. Make reservations in advance.

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IBM'S BOMBING-NAVIGATIONAL SYSTEM

AIRBORNE "seeing-eye" of Strategic Air Command is the task assigned to International Business Machines' new airborne computer. Called "BRANE" (Bombing Radar Navigation Equipment), the new system is to be installed in SAC's B-52's.

The BRANE is built to assist crews under the most strenuous conditions by guiding the plane to its destination and automatically carrying it through the bomb run.

Automatically it computes such variables as rotation of the earth, the earth's magnetic attraction on the compass, changing of wind velocity and direction, bombing run course, and free fall characteristics of the type of bomb carried. It does the "brainwork" which would be humanly impossible for a bombardier and navigator flying at the very high speeds of modern aircraft.

Bombsight periscope is shown in use at the right. Note the insignia on the B-52 nose with the well-known "Thimk" parody of IBM's motto.

Everyone An Inventor

(Continued from page 26)

There have meanwhile been dozens of competing designs introduced both commercially and to the military without any having been adopted as standard. When one goes only a short distance afield, however, there is plenty of opportunity.

Recently introduced is a new *Pressure Pattern Plotter,* (Fig. 2), developed by a Portuguese Flight Dispatcher who recognized the need for an instrument to solve the new problems being introduced by the use of Pressure Pattern Navigation. Heretofore, the Mark II had been used for the chart work with the formulas solved either by a computer or mathematically. This new plotter, which may or may not be the eventual instrument which will become standard, solves a problem which had not been solved mechanically before and therefore the idea received special attention when submitted. It is currently being adopted by several major air lines for the North Atlantic run.

The majority of new designs for navigation instruments are proposals for computing speed, time and distance, since these are the common factors encountered by all aviators. This has been done traditionally with a circular slide rule type of computer of which the Dalton E-6B has been the standard. This, of course, necessitates the use of dividers or a plotter scaled to fit the chart for the actual measuring of distance. However, since the plotter is a necessary item for measuring courses and bearings on the chart, the elimination of its use for measuring distances does not decrease the kit of instruments used by the navigator. Dividers can of course be eliminated. Regardless of this, many navigators apparently desire one instrument which will both measure the distance on a chart and compute the S-T-D conveniently.

This type of solution has been proposed many times and the Jenson Computing Dividers (Fig. 3) were actually manufactured and placed on the market a few years ago. They have not been extensively promoted or publicized but have been flight tested extensively with excellent results on low speed aircraft with the pilot navigating. The idea is excellent for cross-country contact flight in particular. The thinking along this line, and the many ideas submitted, has produced good results in that it stimulated develop-

ment of the Weems Proportional Dividers, an instrument which performs the function with unbelievable simplicity. By altering the scales on regular draftsman's proportional dividers, it is possible to solve for Speed, Time, Distance and measure distances at the same time. Since navigation problems are based on units of 60 instead of units of 10, the 1 to 10 linear scale is replaced with a scale reading from 60 to 600 and one reading from 6 to 60. By a fortunate coincidence it was discovered that, by setting speed on the sliding pivot of the dividers, one end will read distance and the other end time on any linear scale. Likewise, by setting time on the sliding pivot, distance and speed are measured on the points. This is illustrated in Fig. 4.

Many developments of this type will look fine on paper, but will not be well adapted for "in flight" use. This one appeared too simple to be true and was given a rigid test by use almost exclusively in navigating a lightplane (without radio or other modern navigation systems) from England to Australia. This proved to be such a conclusive test that they were immediately placed in production. This is a good example of the results of continued effort by a great number of persons in developing an instrument for which there was a demand.

It would perhaps appear that practically all navigation problems normally solved by non-automatic instruments are well taken care of. This is an erroneous conclusion. As long as there are amateur inventors there will be a multitude of theories and ideas to be solved.

One problem for which we have received dozens of proposals in the last few years, is that of measuring distances on a chart in units of time instead of units of linear distance. Actually the Proportional Dividers do this conveniently but the current crop of proposals is for a system of laying an inexpensive plotter or template on a chart and reading times to various points along the route at a glance. There are many ways of doing this, but the problem is to avoid a confusion of printed speed curves which could result in errors in the air. A solution to this problem, is illustrated in Fig. 5, a simple computer devised by the Hon. R. G. Casey, Foreign Minister, Commonwealth of Australia, an avid aviation enthusiast.

This article has been prepared with but one thought in mind, that is to encourage all who fly to come forward with ideas. The amateur inventor has always been and will continue in great measure to be the backbone of progress. END

Fig. 5. The Casey-Meyers computer.

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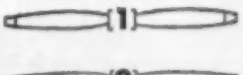

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HANGAR FLYING

(Continued from page 18)

a few turns, I touched down at the field at sunset, but figured there was time enough to shoot one more landing, and shoved the throttle ahead. Strangely, the plane pulled to the right and wouldn't leave the ground. After 1,000 feet, with a third of the runway left to go, I cut the power and taxied back. A quick glance from the cockpit disclosed no apparent obstruction, and since the sidewise pull had disappeared, I concluded that it had only been grass in my wheels. I tried it again, and this time the ship reluctantly left the ground.

Just as I crossed the end of the field, an insistent red flash from the tower caught my eye. Since it was getting pretty dark and the Aeronca seemed to be carrying some unseen load, I made the briefest pattern I'd ever flown. On the final approach sluggishness seemed to appear at a higher speed than before. I attributed this to errors in my frantic attempts to convert kilometers-per-hour readings into miles-per-hour. I landed faster but stopped much shorter than usual. Then, even with full left rudder and full throttle, the plane insisted on taxiing in a circle to the right. After some maneuvering, I made it up to the flight line.

Now the field was nearly dark and deserted except for two apparently worried airport employees who came out to meet me. "Did you know you have a long wire trailing in your landing gear?" one asked in French.

I should have known! The other explained that the wire had been dragged across the power lines at the end of the field as I came in, thereby extinguishing all the lights in the northwestern sector of Luxembourg. Furthermore, he reported, a motorist passing under the line had been showered by sparks and had come in to find out "if the pilot had survived the crash."

I still wasn't prepared for the rat's nest of wire around the right wheel and some on the left, nor for the bigger surprise to come. While they worked to unravel the wire I followed it back to find out just how long it was. The strand which had apparently dragged over the power line ended 300 feet behind the plane, but the other strand went on and on, past the hangar and down back of a parked D-3.

There, believe it or not, the wire was securely fastened to a wood post. I had been tethered like a cow to a pole during that entire last go-around! Feeling like the incredulous yokel who said, "there ain't no such animal," I later worked the event out with slide rule and paper. Surprisingly, it figured that with the plane 1,500 feet from the pole and at 500 feet altitude, the wire's pull on the plane would have been less than 100 pounds. Of course, if I had gone further from the post, the pull would have increased until the wire or the plane gave way.

I expected to lose my license, but the officials blamed it all on the failure of some airport employees to remove a network of wire from the foot-high grass on the airstrip.

RICHARD DRESELLY
New York, N. Y.

JOUST WITH THUNDERHEADS

ON A HOT JULY day, I was ready in Blackwell, Okla. to take off in my Luscombe for Oklahoma City, 110 miles to the south. I could see a huge row of thunderheads 15 miles south of Black-

well, but there was a gap in them about 2,000 feet wide. A hard downpour of rain was falling on each side of the gap; it looked like a clear mountain pass. I checked with Ponca City 10 miles away and learned that weather was adequate at Oklahoma City. I could see sunshine clear through the gap and on the other side, apparently not more than two or three miles through.

At that time, I was a firm believer that when a man's gotta go, he's gotta go, so took off against the advice of the airport operator. He briefed me on doing a 180, and said he'd bet I'd be back within 15 minutes.

The alto-cumulus reared angrily on each side of me as I bored into what I thought to be a lucky passageway. I entered at 800 feet, thinking the cold rain on each side of me would force the hot air up and keep the clouds separated until I could get through. When I entered the passageway, there was a hissing sound like steam escaping from a boiler and my rate of climb needle flipped to 1,500 feet per minute. I turned on carburetor heat and closed the throttle, but the Luscombe was still climbing 1,000 fpm in level flight. I dropped the nose 30 degrees, but it still climbed. By this time, I had been carried to 5,000 feet. There was still the hissing of compressed air that could be heard over the sound of the idling engine. Without a "G" meter I didn't know what strain was being placed on the plane but it seemed fairly consistent, not too much roughness. I lowered the nose a bit more and held my ascent to about 300 to 400 fpm.

I could see the other end of the passageway but it began to narrow. At 6,000 feet big slugs of rain began falling on my windshield. The black clouds on each side of me seemed to be boiling and seething like a cauldron. I stayed in the center of the gap for fear I would be sucked into the clouds and be machine-gunned to death by hail.

Oh, sure, I finally got out of it but never again for me. Let them joust with thunderheads who will. . . . I've gotten more sense now.

EDGAR W. ADAMS
Oklahoma City, Okla.

I Learned About Flying from That!

(Continued from page 46)

I scribbled my name, checked the weather, downed a hot cup of coffee, gave thanks for everything and headed for my jet. The kid ops officer assured me all had been checked. Despite this assurance, intuition and habit took over. I made out like I was casually watching another jet come into the pattern. With the wind cutting about my ears like sharp knives, I circled the ship, patted the two gunnery access doors, just a cursory pat I admit because they hadn't been open. I had seen to that. Or had they?

Affectionately I rubbed my right hand along the slender wing—I couldn't help doing that. I love airplanes. I plunked the right tip tank and heard it thump like a ripe watermelon—sure it was full. I carried on with the "walk-around-inspection," tugged at the bronze tailpipe, looked up the black void towards the 96 turbine blades known as "buckets." I patted the other tip tank, kicked at the main gear tires and peeped into the "bird cage," the place where the extended dive brakes leave a gaping hole in the belly of the ship. Everything seemed okay and I climbed into the cockpit.

In a few seconds I was strapped in, my uniform cap tossed into the empty back seat, and the hard helmet gloved over my head. I signaled the ground crew to rev up the APU—a Russian sounding word for Auxiliary Power Unit used to fire-up jet engines. The cockpit lights began to blink like a pinball machine. I pressed the toggle of the fuselage tank, moved the starter switch, read nine per cent on the tachometer, pressed the ignition, the automatic fuel pump and heard the welcome "boom." My fire was burning, flames were in the tubes. The *T-Bird* was cooking and ready to leap. As the tachometer climbed past 20 to 28, the tail pipe temperature pushed upward to 600—800—980. Fine. At 30 per cent, I brought the throttle "around the horn" and waved for APU disconnection. I cut back switch after switch and buckled my oxygen mask across my face.

"Scott Tower—Air Force Jet Two Zero Eight ready for taxi and take-off instructions." The sergeant handed me the downlock pins, closed the canopy to shut out the unfriendly wind and scurried to a safer distance. The cockpit grew warm and personal as the tower monotoned all the instructions I needed. The J-33 engine boiled like a depot stove. Here now was the never ending thrill—the moment of readiness. Ahead to beyond infinity stretched the purple plain of sky, man's last frontier, and the thought of being a part of the great conquest of the air surged through my brain.

I made final check while taxiing. Out there the tip tanks looked good—good and heavy because they weighed more than a ton apiece. The caps were firm and no leaks visible. Fuel pressure checked with the toggle switching; radio compass—the "bird dog"—okay; stabilizer set for take-off, canopy locked and red light out; inverter "on" and another red light out. And so on. All mechanical—perhaps too

(Continued on page 71)

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"It was only a short time ago that if you wished to express the iden that anything was utterly impossible you would say, 'I could no more do that than I could fly.' It was the height of impossibility that we should fly and yet it is only a few years since the first man flew and we are only at the beginning of aviation. What a delightful idea it is to go sailing through the air. . . .

"We know perfectly well that the time is coming when it will be an every-day thing to go from place to place through the air. Even today we have startling propositions to do things that are apparently impossible. A man proposes to try this summer to fly across the Atlantic Ocean in a heavier-than-air flying machine. The strange thing about the matter is that experts who have examined into the possibilities find that he really has a fighting chance.

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"Then at an elevation of two miles high in the air there is a constant wind blowing in the general direction of Europe having a velocity anywhere from 25 to 50 miles an hour.

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(Continued from page 69)

mechanical as I followed down the mental check list.

Moments later I was rolling down the runway—a hundred per cent now, tips on, emergency take-off pumps on—the light was green. At 70 mph I shifted steering from brakes to rudder. At 80 I eased the weight off the nose wheel. The wind was strong and gusty and I held to the concrete until 130. Then a quick but gentle pull back on the stick and wheels up. The airspeed jumped to 150, 180, and 200. With flaps tucked back into place, I aimed for the open sky and again felt the tingling exhilaration that sustains the soul of the airman.

Then it happened, like a knife to my heart. I saw a movement across the metallic surface directly outside and to the front of my canopy. I watched, stunned, as a wavering crack developed across the sleek nose of my ship where no crack should be. A morbid, uncanny fear momentarily fogged out any rational thoughts. The left hand gunnery access door began to open—to open into one of those tragedies that always happen to someone else. Now this was about to happen to me, and the chill I felt was not unlike the raw edge of the north wind I had just closed from my cockpit. For a brief instant a kind of terror the jet jockey calls "panic" almost took over. Fortunately, the shock was brief and my thoughts came full circle. What to do? There had to be something. I couldn't bail out of the *T-Bird*, not at 150 feet. I couldn't leave a pilotless, fueled-up chunk of hot metal to careen wildly into someone's home below.

Analyze, think quickly! The door wasn't trying to open at 190 but, at 200 indicated, it began to crack. The answer might be speed. It had to be. Don't let that speed build up! But how could you fly a ship at take-off speed when it's streamlined for 600 and weighed down with nearly three tons of fuel?

Gently I pulled back on the throttle. Gently the air speed slithered back of 200—to 180, mushing now, and the tops of the trees grew closer, but the crack no wider. My oxygen mask began to sweat and I knew the next moment would be decisive.

I pulled the nose up a little—might as well make a test as auger in without making one. Up just a little and the curved crack where the black anti-glare paint of the nose joins the silver dural door, yawned menacingly. Quickly I eased back down to level flight and again the crack tried to close. I nosed down a degree and the crack closed. But I couldn't fly nose-down very long at this altitude. Then I remembered—"dive brakes"—under the belly—between the main gear. Extended, they caused the flow of air past the speeding fuselage to change. Down went my dive brakes and, sure enough, the door sucked closed. Now I had to get rid of the heavy 230 gallon tip tanks. Without them I'd be free and could put this ship back on the ground safely. Oh, that fool who opened the forbidden door and left it to kill.

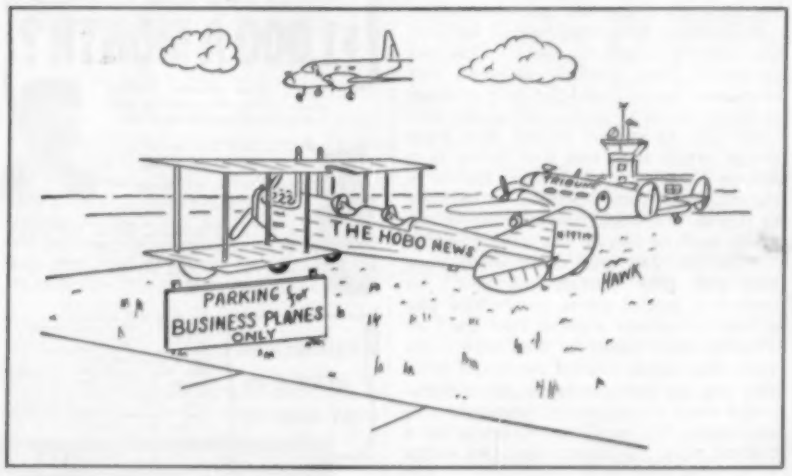
I reached for the red tip-tank release and was about to press when again my thoughts froze. Below me in all directions were houses, here a school, there a church, there a group of kids playing ball in the road. I couldn't drop the tanks. They had to stay with me and I had to get back on the ground. Any second at this low altitude and dangerous mushing speed, a gentle gust of rising or falling air and the door would fly open, rip into my tail controls or twist the *T-Bird* into the trees below. There was no time to orbit and use up the tip tank fuel. I had to land and the landing had to be made with all the fuel aboard.

Only with nosedown were things real good. Quickly I beat a pattern for the throat of that runway I just left. I heard my hollow voice call the tower and tried hard not to sound excited: "Two zero eight to Scott—I have an emergency—left hand gunnery access door opening—request immediate landing."

The tower came right back: "Okay, use same runway—three one. Wind two five and slightly crossed from the left."

I kept turning and found, as I dragged a pattern approach, that I could hold the altitude at 170 knots. Any slower and the *T-Bird* began to settle. Two miles out I lined up center with the runway. Two miles ahead was smooth inviting concrete, over a mile long. The frozen earth

(Continued on page 72)



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(Continued from page 71)

was less than 100 feet below me by now. A thermal or strong gust of wind this close to the wire would certainly be ironical.

Even the sun felt cold on my face. Normally, it is warm through a canopy. Far ahead I saw the fire engines rush across the field with red lights flashing. Behind them, the ambulance, the comforting "meat wagon"—friendly forces all, hastening to the place they figured I'd hit. A half century stretched across the next 30 seconds it took me to reach the end of the runway and grease onto the strip at 150 indicated. The wheels gently touched and the *T-Bird* rolled smoothly. The airspeed dropped, 145—140—and, at 135, the would-be killer finally struck. The left gunnery door plopped wide open. Instantly, the rudder tilted to the right and I felt a giant iron hand push the *T-Bird* off center-line. I struggled with all my strength on opposite rudder but the forces at work veered the ship completely off the right hand boundary of the runway and into an area of rough and deep frozen mud ruts. I fought for stability as the *Bird* rocked and bounced crazily over the ruts at over 100 mph. The loaded tip tanks danced up and down on the wings like two drunken things. Then as suddenly as the door had gone open, it flopped back down and control was turned back to me. I glanced towards the smooth concrete runway, fearful every second that the gear—nose or main—might snap and roll my *Bird* into a ball of flaming aluminum. The gear held up. I finally regained the concrete, and breathed once more as I saw the asbestos-clad crewmen waiting up there on top of the red wagon with their long foam nozzle spouts readied for action. I waved at them as I turned off onto the taxi-way and mentally thanked the big Boss up there in the sky.

Back in front of ops the crew parked me in the same VIP slot—a sadder but wiser gray-headed pilot. It took several minutes before my feet ceased shaking on the rudder pedals. I pulled off the oxygen mask and heard myself muttering cusses at the jug-head who tampered with my gunnery doors. But of course he didn't hear it, and I was glad he didn't for, after all, I was the one responsible.

In carefully measured tone, I told the men gathered about my cockpit what had happened. They dutifully fastened that crazy door again. And I dutifully crawled down to check it again, and again, and again just to remind myself that these things aren't toys and that flying is a serious business all the time; that it is rugged, meticulous business, as exciting as any in this world and nothing—absolutely nothing can be left to chance.

Sure, the day may come when your hair gets gray enough and you'll be parked in special places and treated like a Very Important Person. Just don't let it throw you. Listen to that little inner voice. The people around you might think you are an unappreciative nit-picker—might even think you're downright discourteous. But you'll grow up to be a retired pilot, my friend. And that seems to be what most of us would like. END

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Hangar Lore on Magnetos

(Continued from page 35)

timing procedures for all magnetos are pretty much the same. Here are the four basic steps:

1—Check the magneto to make sure it is correctly, internally timed.

2—Set the engine crankshaft at #1 cylinder firing position according to the manufacturer's instructions.

3—Turn the magneto to its #1 firing position.

4—Install the magneto on the engine and adjust at the drive end for final timing.

This series of magnetos has a timing window (Fig. 3), on top of the cover, through which a set of timing marks are visible. When the stationary mark and the mark on the rotating gear are lined up, the magneto is ready to fire on the electrode marked #1. This is connected to one of the spark plugs in #1 cylinder. To time the magneto to the engine, turn the engine to bring the piston in #1 cylinder to the firing position. (On some engines you simply line up the mark on the rear prop flange with the split of the engine crankcase below the prop shaft.) Make certain the piston is on the compression rather than the exhaust stroke. If your engine is not so marked, you may have to use a timing disc. Check the manufacturer's instructions.

With the engine in firing position, line up the timing marks in the window of the magneto and engage the drive to the engine. Recheck the marks to see if they have moved. If it has been necessary to move the magneto rotor to engage the coupling, a final timing adjustment must

Fig. 7. Two different lengths of wire terminal are used in these magnetos.

be made. On the flange-mounted magnetos, the slotted mounting holes permit you to twist the magneto on its mount for final timing. When the marks are in alignment, tighten and safety the mounting stud nuts.

Base mounted magnetos are bolted to a base and depend upon some form of adjustable coupling for final timing. The most common type of coupling is a pair of serrated drives with a matching rubber coupling between. The magneto drive has 20 teeth while the engine drive has only 19. Rotating the rubber coupling one tooth, without moving either the engine or the magneto, will change the timing in the same direction by one degree. In practice, the engine and magneto are turned to the timing positions; the magneto is slid onto its mount and the rubber coupling turned to a position where it will fit the serrations of both the magneto drive and the engine drive. Then the coupling is engaged and the magneto bolted down.

In replacing a magneto after service, make certain that you connect the spark plug leads to the proper cylinders. The numbers on the magneto distributor cap are the firing order of the magneto—*not* the engine. A four cylinder magneto, for example, would probably be connected 1 to #1 cylinder on the engine, 2 to 3, 3 to 2 and 4 to #4 cylinder. A five cylinder engine firing 1-3-5-2-4 would be connected 1 to 1, 2 to 3, 3 to 5, 4 to 2 and 5 to 4. The firing order is given on the engine plate.

Internal timing refers to the relationship between the rotating magnet, breaker points, distributor segments and high tension terminals. As already stated, the points should open at the position of maximum flux for the hottest spark. On the SB and SF magnetos, this is the position where the timing marks shall line up. Contact point timing on these magnetos is very easily obtained by adjusting the contact point clearance. With the timing marks aligned in the window, the points should be on the instant of opening. If they are not, loosen the two screws, Fig. 4, which hold the adjustable contact. Slide this contact until the points are on the instant of opening and retighten the screws. The points are not set to any fixed clearance, and point clearance may vary widely in service without affecting magneto operation. The contact point timing may be done with the magneto mounted on the engine if necessary, but you may need a timing light to tell when the points break.

To help in trouble-shooting these magnetos, here is a list of the more common magneto troubles and their cure. *Caution.* Remember that when the magneto ground wire to the ignition switch is disconnected, the engine is HOT. If you have to move the propeller, either ground out the magnetos with a short jumper wire or make certain that you stand clear.

Engine cuts out on one magneto.

1—Magneto incorrectly timed to the engine. (Firing on the exhaust stroke.)

2—Condensation of moisture in the magneto, causing flashover or shorts. Wipe insulating surfaces clean with acetone and coat lightly with oil.

3—Magneto contact points fouled or out of adjustment.

Engine rough. Rpm drop on one or both mags.

1—Contact points fouled or out of adjustment.

2—Moisture in magneto causing ground or flashover to the wrong distributor electrode.

3—Bad condenser. Check by replacing with a condenser known to be good. See Fig. 5.

Engine runs rough and backfires.

1—Magneto out of time.

2—Ignition cables improperly connected. Engine firing out of order. END

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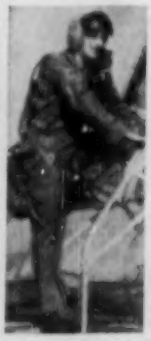

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Load or Overload

(Continued from page 44)

duster aircraft, but the same angles apply to all flying. One of these considerations is, "How warm is an engine after it's warmed?"

A pilot was taking off over a lake, from a 1,200 foot runway. He was hauling cotton dust in a Stearman. It was early morning, and he had been lifting 700 pounds off the strip the night before. He warmed his engine, loaded 700 pounds, opened the throttle and wound up in the lake, with nothing but his head out of the water, and that rapidly sinking—plus the fact that the water made it impossible to work the catch on his web safety belt. A mechanic swam out and cut the safety belt with a pocket knife just as the pilot was about to drown. Scarcely ever will an aircraft engine on the ground warm up sufficiently to carry original maximum loads. It takes a short flight to warm it properly. And remember that wing efficiency decreases greatly with only a slight increase in altitude.

All such considerations influence loading. With a maximum load, a water puddle ten feet wide and half an inch deep on a concrete runway will sometimes create sufficient drag to slow your plane enough to cause mishap. An overly rough surface will cause bouncing, disturb the airflow and influence load consideration. It is almost impossible to haul much load at all from a soft runway, even if it is only slightly spongy. High weeds or grass will create enough drag to demand attention to loading.

I was flying an Aeronca *Champ* with an 85 horse Continental, spraying wheat in Montana. One morning I loaded 42 gallons of chemical and 12 gallons of gas to take off from a field elevation of 4,750 feet. The job I was to spray was 1,000 feet higher, a grain field on a plateau. When I arrived at the location, the flagmen were not there. I could see them about eight miles away, sloshing along through the muddy road in the heavy chemical truck. I landed on a narrow strip of smooth sod by the wheat field to wait for them. About 39 minutes later, they arrived and we were ready to begin work. I had a good 2,000 feet of prairie sod for take-off, but it was crosswind, and the sod terminated abruptly in a canyon 300 feet deep.

The possibility that I might not make it never entered my mind. I opened the throttle and headed for the gorge, telling myself that, since I had burned out better than four gallons of gas and had more runway than on my original take-off, I had it made. What happened in the next 60 seconds still scares me every time I think about it.

After using up all but a hundred feet of my sod, I was still on the ground. There was no chance of stopping the ship before it went over the rim—it was make it or bust. I stalled over the rim of the canyon, bounced my wheels on a shelf 100 feet below, and with that bit of help finally picked up flying speed near the bottom of the canyon.

I wasn't loaded, I was overloaded. A lot of variable conditions can make the difference.

END

Master Modifier

(Continued from page 37)

the stresses, but also that Cessna's structure would withstand the various landing shocks through the existing motor mounts. I needed high specialization for this project so called on A. M. Kaplin, former Lockheed stress man, and his crew from Strato Engineering in Burbank, to do much of the complicated analysis on the MetcoAir kits. The latest project that MetcoAir has flying is a tricycle gear for the Cessna 180 series."

Correspondence which I perused in MetcoAir's files seems to indicate a wide market for 180 kits. One of Hebert's dealers, Louis McCollum of Mattoon, Ill., manager of Wacha McCollum Aviation, writes, "Each day makes me more enthusiastic about your tricycle gear. I have sold all my present kits and need two more. Please advise progress on the 180 gear. I could sell a dozen."

"We try to keep operating costs down," explains Hebert. "That's the only way we can build up volume and thus absorb engineering costs. The average private pilot is a fiend for conversions. He likes to do anything which will give him better performance than the next guy. Actually, almost any good aircraft overhaul shop could put out our conversion but the engineering costs would be out of this world."

As President of MetcoAir, Hebert spends much of his time "on the road" with his dealers. He makes the East Coast at least once each month. Normal procedure is to work all day in the Fullerton office, have dinner and climb into "Old Betsy," the prototype model of the tricycle Cessna 170. This is the same plane that went through the CAA drop tests which usually send an air frame to the boneyard. "Old Betsy" has a 13 gallon auxiliary tank so Tom has 54 gallons of gas.

What's next for MetcoAir? Hebert gets a far away gleam in his blue eyes, puts his feet up on the desk and begins to talk.

"We have immediate projects on the drawing boards which include metal wings for the Aeronca *Champion*, possibly wing-tip fuel tanks for the Cessna 180, and metal skins for the Piper *Tri-Pacer*. But the real future is going to be in our new four-place airplane. We're building it a little at a time. Each day we learn more about light aircraft design, development costs and sales technique. Many of our present modifications will go into the future plane, lock, stock and barrel. The new four-placer will be all metal, slightly wider than the Cessna 170 and have a full monocoque fuselage. The nose gear will come from our present Cessna kit. The wings will come from either a Taylorcraft or Piper conversion and we feel that we can sell it, even with today's high labor prices, for around $6,000 with a 145 or 150 hp engine.

Hebert believes engineering and tooling costs can be written off on the first 1,000 aircraft at $350 per unit. The plane is being designed to utilize a minimum of tooling, and only 200 man hours of assembly time on each completed aircraft. "We would have had this plane in the air months ago, had it not been for finances," explains Hebert.

Performancewise, the 150 hp plane will cruise at 130 mph, while a 165 to 175 hp version, to sell for around $7,000, will cruise at 140 and have improved climb and service ceiling. The plane should be ready for flight test by early autumn. END

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(Answer on Page 78)

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FLYING CALENDAR

April 26—Confederate Air Force of Miami convention at Havana, Cuba, by invitation of Pres. Fulgencio Batista.

May 2-5—Twelfth Annual Nat'l Forum of the American Helicopter Society at Sheraton-Park Hotel, Washington, D. C.

May 3-5—Washington State Apple Blossom Festival, Wenatchee, Wash. Fly-in breakfast at Fancher Field and Apple Blossom Parade May 5. Transportation furnished from Fancher and Pangborn Fields.

May 4-6 — Eighth Annual Convention and Air Meet of National Inter-Collegiate Flying Ass'n., under the auspices of "Air Knockers" Flying Club, Univ. of Okla. All events and activities will be held at the University's Airport, Max Westheimer Field, Norman, Okla.

May 5-6—Sportsmen Pilots Handicap Air Race open to any private or commercial pilot. Contact Thomas C. Buck, 13106 Galway St., Garden Grove, Calif.

May 10 — Fifth annual Skylady Derby from Dallas to Little Rock, sponsored by Woman's Nat'l. Aeronautical Ass'n.

May 13-23—Seventh All Woman's International Air Race, Hamilton, Ontario, to Havana, Cuba. Prizes: $2,000 cash and numerous trophies. Deadline entry: May 1. Irma Price, Entry Chief, 242 S.W. 8th St., Miami, Fla.

May 25-26—Third Annual Tucson-Hayward Air Race sponsored by 20-30 Clubs of Tucson and Hayward. All aircraft are due in the Old Pueblo on or before May 25.

June 2—7th Annual Maintenance and Operations Meeting, Reading Av'n. Service, Inc., Reading Mun. Airport, Reading, Penna.

June 8-10—Missouri Pilots Ass'n., Air Tour. Contact Missouri Av. News, Div. of Resources & Development, Jefferson City, Mo.

June 9-10 — 4th Annual Steak Flight, Ranchaero Airport, Chico, Calif. Sponsors: Butte Cy. Sheriff's Aero Sq. & Chico Sq. #76, CAP.

June 10 — Quad-City Airman's Ass'n., fly-in breakfast. Contact: Henry A. Zimmer, Quad-City Airman's Ass'n. Quad-City Airport, Moline, Ill. Rain date, June 17.

June 17 — Second Annual Air Show, sponsored by Post 1920, Veterans of Foreign Wars and Burlington Flying Serv., Inc., Burlington Mun. Airport, Burlington, N. C.

June 17-22—Fourth Annual Philadelphia Jaycee Air Cruise from Phoenix, Ariz., to Philadelphia, Pa. George H. Baughman, Chairman, Air Cruise Committee, Jr. Ch. of Commerce, 121 S. Broad St., Philadelphia 7, Pa.

June 23, 24 — Porterville Pilots Area Ass'n. 9th Annual Moonlight Flight. Wiener roast, dancing, entertainment free to all who fly in. Lighted field, 5,000' & 6,000' runways, control twr. Write: PAPA, 1110 Mill St., Porterville, Calif.

July 1—Annual Grand Haven Dawn Patrol, Grand Haven Memorial Air Park, Grand Haven, Mich.

July 7-10 — Tenth Annual All-Woman Transcontinental Air Race from San Mateo Cy. Airport, San Carlos, Calif. to Bishop Airport, Flint, Mich. For details, contact: Betty Loufek, Director, Public Relations, AWTAR, Inc., 5316 Carita St., Long Beach 8, Calif.

July 29 — 7th Annual Trophy Race, Lunken Airport, Cincinnati, O. Write: Margaret L. Berning, Greater Cincinnati Airmen, Inc., Adm. Bldg., Lunken Airport, Cinti 26, O.

July 30-Aug. 2—First Nat'l Flying Clubs convention, Seattle, Wash. Washington State Av'n Ass'n. will be host to 600 private planes participating in special events, safety conferences and mass flight over Seattle. Marleigh Udall of that city spots model planes on map of U. S. for each city represented. Contact Stuart Nicholson, 1466, 14 Dexter Horton Bldg., Seattle, Wash.

July 31-Aug. 9—23rd National Soaring Contest at Grand Prairie, Tex., sponsored by Texas Soaring Ass'n., under auspices of Soaring Soc. of America.

Aug. 3-5—Fourth Annual Fly-in of the Experimental Aircraft Ass'n., Oshkosh, Wisc. Steve Wittman, host. Write: EAA, 3081 S. 56th St., Milwaukee, Wis.

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Good Management Saves An Airport

(Continued from page 27)

familiar pattern of small airports now become pastures and housing projects.

The new operators were firm in the belief that the airfield's trading area, Greater Akron and neighboring Barberton, with a population of some 350,000, could support a private airport operation. Akron Municipal Airport hasn't had an operator on the field for several years, nor is there a field to service industrial Barberton and surrounding areas.

When the firm took over, it went in with the avowed purpose of making money. This idea seemed rather startling in that so many people got to thinking an operator should be in the flying business for his health.

The first action of the company after it took over was to clean up the hangar and fix the doors. After that came a high in hangar rentals. If a man can afford to own an airplane, he could afford to pay a fair charge for good facilities and service, reasoned the new operators. Sure, there were threats to go elsewhere but they subsided when the plane owners saw the improvements and rehabilitation program continuing.

Next came the field itself. A North-South runway (3,000 feet), and longer than the NW-SE was cut. Both runways were then dragged, smoothed out, and the grass mowed. Taxiways and ramps also came in for filling and smoothing. Water in the shop was drained off and the roof repaired and shored up. The office received a redecorating job while additional equipment went into the shop. A full-time A&E went on duty. A new windsock went up while the roadside and hangar signs got new lettering and fresh coats of paint. Instruction has increased to a point where 20 students are presently flying.

Along with George Maddox, who handles instruction full-time, a full-time A&E is kept plenty busy while a line boy handles odd jobs, gassing and pushing aircraft around. Stark and Stadvec, along with two other commercial pilots, are on call evenings and weekends for passenger hops and charter work; Stadvec does the instrument instruction.

While not making money in big basketfuls, the Maddox and Stark Company has put the field into the black. Monthly increases have been recorded in over-all dollar volume. Gas and oil sales have been going up and the shop has work scheduled ahead.

Passenger hopping has increased to where 20 flights are average on Sundays and 14 on Saturdays. This has been attributed to the large repainted roadside sign. All business is now on a cash basis with repair work payment required before the airplane leaves the field.

"Too many operators in the past have extended credit to 'friends' who never bothered to pay up or paid whenever they felt like it," said Jack Stark. "We won't make the same mistake," he added.

Improvements to the field were made with no great outlay of cash. Some good

(Continued on page 78)

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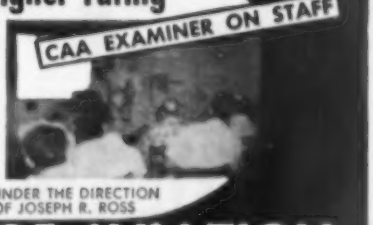

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old-fashioned horse-trading enabled the company to get the services of a sign painter, carpenters, welders, a borrowed tractor and a lot of labor. Flying time was traded on an even up basis to those tradesmen who were also pilots. The line-boy, a 17-year-old, now checked out in every plane operated by the company, gets his pay part in money, with the remainder in flying time. Several teenagers hanging around the field received instruction for work done. Two of these youths have continued their flight training as cash customers. Promotion and advertising, badly needed by every airport operator, also was obtained by trading. The company flew several radio and TV announcers and sportscasters to a fishing spot in exchange for free plugs on the air. For newspaper space, the firm contacted the local paper's aviation writer and continually feeds information to her about local flying activities and pilots. This contact brought the newspaper's aerial photography business over to Maddox and Stark.

Future plans for the firm call for additional improvements to the field along with lengthening the 2,200 foot N-S runway. Construction of a number of T-hangars is now in the planning stage.

One idea which has paid off was a company offer to make its aircraft available for transporting of city and civil defense officials to designated evacuation areas during practice air raid alerts. The city has agreed to pay gas and oil, with the airplanes and pilots supplied by the Maddox & Stark Company.

The three men feel there is a place in the community for a private operator, but like any other business, the profit reward must be there. By offering service, facilities, and a line of aviation activities at a fair price; and by letting the community know what they've got, the company feels it can't miss. So far, things are looking up. END

ANSWER TO "WHERE AM I?"

(Page 75)

Houston, Tex., named for General Sam Houston. Landmarks are the Shamrock Hotel and Prudential Life Building.

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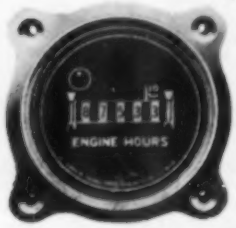

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Maintain proper two position & level flight. Has built-in ball and liquid level. Operates off of vacuum pump. 3" dia. face. In excellent condition. **12.50**

RATE OF CLIMB INDICATOR

Type C-2 Kollsman. Gives rate of climb from 0 to 6000 feet. Operated from static side of pitot tube. Requires no pressure or vacuum power. Also shows rate of descent. Diaphragm type **17.50**

Pioneer ALTIMETER

Ideal for all types aircraft. Has a range from 0 to 35,000 feet in increments of 20 ft. Barometric dial in inches of mercury. Can be adjusted to barometric pressure in any area to compensate for height above sea level. **12.50**

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Can be used for navigation of aircraft or boats. Designed to "shoot" Sun or Stars. Unit contains a horizon indicator, an astigmatic lens, bubble level and battery case. A spring wound motor provides the drive. The exceptional optical system is internally illuminated for night use. Here's a real bargain worth many times our price.

Only **17.50**

GENUINE NEW AN-6530 AIRCORPS GOGGLES

New – with precision ground and polished, interchangeable lenses. Choice of 3 lens colors – Clear, Amber or Green. Frames are rubber covered with a soft chamois lining and built-in, non fogging lens ventilators. The nose bar is adjustable for added comfort. WINDPROOF – DUSTPROOF! With elastic headband. Genuine Air Corps Surplus. Please specify which lens color desired. . . . . ONLY **2.79**

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Briefings . . .

(Continued from page 12)

wardrobes for the women who would fly in these aircraft, stole the show at the recent gala opening of Atlantic Aviation's new $600,000 hangar at New Castle, Del. The guests, majority of whom were male, showed enthusiastic approval.

BECAUSE SHE EMBODIED all of the qualities of the "ideal Airline Stewardess," Miss Muffet Webb of Braniff Airways was selected out of 300 contestants for the "Miss Skyway" Award of 1956. Miss Webb's prize was an imported sports car. The award coincided with the 25th anniversary celebration of the airline stewardess service, the current membership of which includes 5,000 young women between the ages of 21 and 27 years.

CLIMAXING THREE YEARS research effort toward using the benefits of boundary layer control for rotary wing aircraft, Cessna has revealed that the first successful flight of its BLC equipped CH-1 helicopter was completed a year ago. The CH-1 is powered with a 260 hp Continental engine. Details are classified.

METAL FATIGUE CRACKS are often caused by careless handling and ignorance of stress principles. When a strut is cleaned, it should never be scraped with a sharp tool. A sharp edge can cause a scratch that changes the cross section loading of the material. This sets up an abnormal stress. The result . . . fracture.

A COMBINED STEP DOOR that can be quickly installed on any Twin Beech is being offered to owners of this type aircraft by the Ohio Aviation Co., Vandalia, Ohio. Approved by CAA, the door step conversion can be made in four days. It folds up smoothly and is secured tightly by a heavy duty lock with separate safety catch. A "slip cover," in color to conform with interior decoration, disguises the steps when the door is closed.

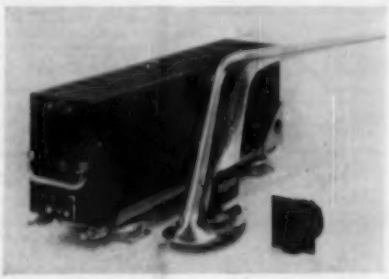
COURSE ACCURACY of VOR has been improved from the present operating tolerances of plus or minus 3.5 degrees to plus or minus 0.55 under near normal conditions through a new four-loop antenna array developed by CAA. The four-loop VOR will also present better indications on the cockpit instrument and will narrow the "cone of confusion" over the station where no positive bearing information is possible. Furthermore it offers a smoother transition on the "to-from" indicator. Installation of the new antennas at all 406 VOR stations is expected by fall of 1957.

THE CAB HAS AMENDED Civil Air Regulations 43:30 to require an artificial horizon and directional gyro, or equivalent, for flights under IFR. This amendment becomes effective Aug. 1, 1956.

CIVIL AIR PATROL CADETS may compete for three new 4-year aeronautical engineering scholarships. Honoring Gen. Carl A. Spaatz, Gen. Lucas V. Beau and Col. D. Harold Byrd these new awards—available in 1957—bring to five the number that have been offered to CAP Cadets. Last year the Ziff Davis Publishing Company awarded the Wm. B. Ziff Memorial Scholarship. Another was offered by CAP Col. Wm. W. Plankinton.

PACIFIC AIRMOTIVE has been appointed distributor for Scintilla magnetos, parts and ignition analysers, in the Rocky Mountain area. The services will be handled through Pacific Airmotive's Rocky Mountain Branch at Stapleton Airfield, Denver, Colo.

TO COMPLY with more stringent TSO requirements by CAA for airline-type equipment, Narco has introduced the



Sapphire 1016 VHF communications unit with 90 to 360 transmitter channel capacity and up to 560 channel receiver capacity. The new unit weighs 25 lbs.

BELL'S FIRST six commercial helicopters off the production line this year at Fort Worth, Tex. were all assigned to different countries. Nations listed on the shipping manifests included New Zealand, West Germany, Canada, United States, Venezuela and Austria.

THE FIRST FIBERGLAS TAYLORCRAFT has been shipped to New Zealand for utilization in aerial fertilizing and pest control. Due to the fact that some of the chemicals used in this field have a high corrosive action, it is suggested that an aircraft of this type fabrication may be better able to stand up under this usage.

A SCHEDULED AIR TAXI service between Detroit and Cleveland, operated by Air Taxi Group, Inc. of Toledo, O., is to begin operation this Spring. Passengers will board the plane—a Canadian De-Havilland *Otter* on floats—at the seaplane base on the Detroit River and in less than 60 minutes deplane at Cleveland's Lakefront Airport. Contemplated one-way fare is $14 plus tax. Egner A. Eklund, Elyria, O., formerly a pilot for Capital Airlines, is vice president and business manager of the group.

HANDLE CAREFULLY when this sign is spotted on packaged materials or cargo. It is the international symbol for radioactive material developed through IATA and approved by interested governments to identify shipments of radioactive material. This symbol is one of a number of standard labels, identifying special cargoes, which are basically pictorial in order to avoid any confusion of language in worldwide air shipments.

GROWING CONFUSION over the terms VTOL and STOL has been cleared up by Air Force and Defense Department officials. A true VTOL is an aircraft which takes off and lands vertically with no take-off run. STOL is an aircraft capable of take-off in less than 200 feet.

AIRMARKING showed a healthy growth across the country in 1955, with the installation of an additional 2,147 markers. This brought the total number of these valuable pilot aids to 10,050. The increase in markers was largely the result of State aviation agencies, with assists by groups including the 99's, Girl Scouts, Boy Scouts, Chambers of Commerce, U. S. Forest Service and especially the Standard Oil Co. of California, which has a permanent air marking program for 375 markers in eight Western states.

TACTAIR, INC. designers of a new type automatic pilot for business and light aircraft, have been acquired as a wholly owned subsidiary by Aircraft Products, Inc. of Bridgeport, Pa. To be operated as a division of the company, Tactair activities henceforth are to be carried on from the main plant at Bridgeport.

J. ADDINGTON WAGNER, National Commander of the American Legion—shown with Col. Roscoe Turner, chairman of the organization's national Aeronautics Committee—makes continuous use of the Legion's *Aero Commander* in his efforts to visit as many as possible of the state and local Legion posts. In 1955 this plane

flew over 100,000 miles on Legion business. A former non-flying Naval officer, Comdr. Wagner leaves the piloting job to J. F. "Jim" Parham.

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announcing . . . for airline and executive aircraft use

THE Sapphire 1016

90-360 CHANNEL VHF TRANSMITTER

90-560 CHANNEL VHF RECEIVER

Complete unit occupies ½ ATR rack, weighs 24¾ pounds. Unitized construction permits quick separation of transmitter, receiver and power supply units for easy servicing.

Narco introduced its airline-quality Sapphire line of navigation and communications equipment with the Narco DME...Now comes the Sapphire 1016 VHF communications unit designed to meet the maximum channel requirements for airline and executive aircraft use.

The Sapphire 1016 includes a high-powered transmitter of 90 to 360 channel capacity. It has a crystal-controlled receiver of 90 to 560 channel capacity with precisely defined 50 kc channel separation available throughout the entire range from 108 to 135.95 megacycles.

The Sapphire 1016 meets latest CAA TSO requirements for airline use. While its performance and channel capacity match the finest airline-type equipment available, the 1016 is offered at only a fraction of the cost of comparable equipment. See your Narco dealer or write for full details.

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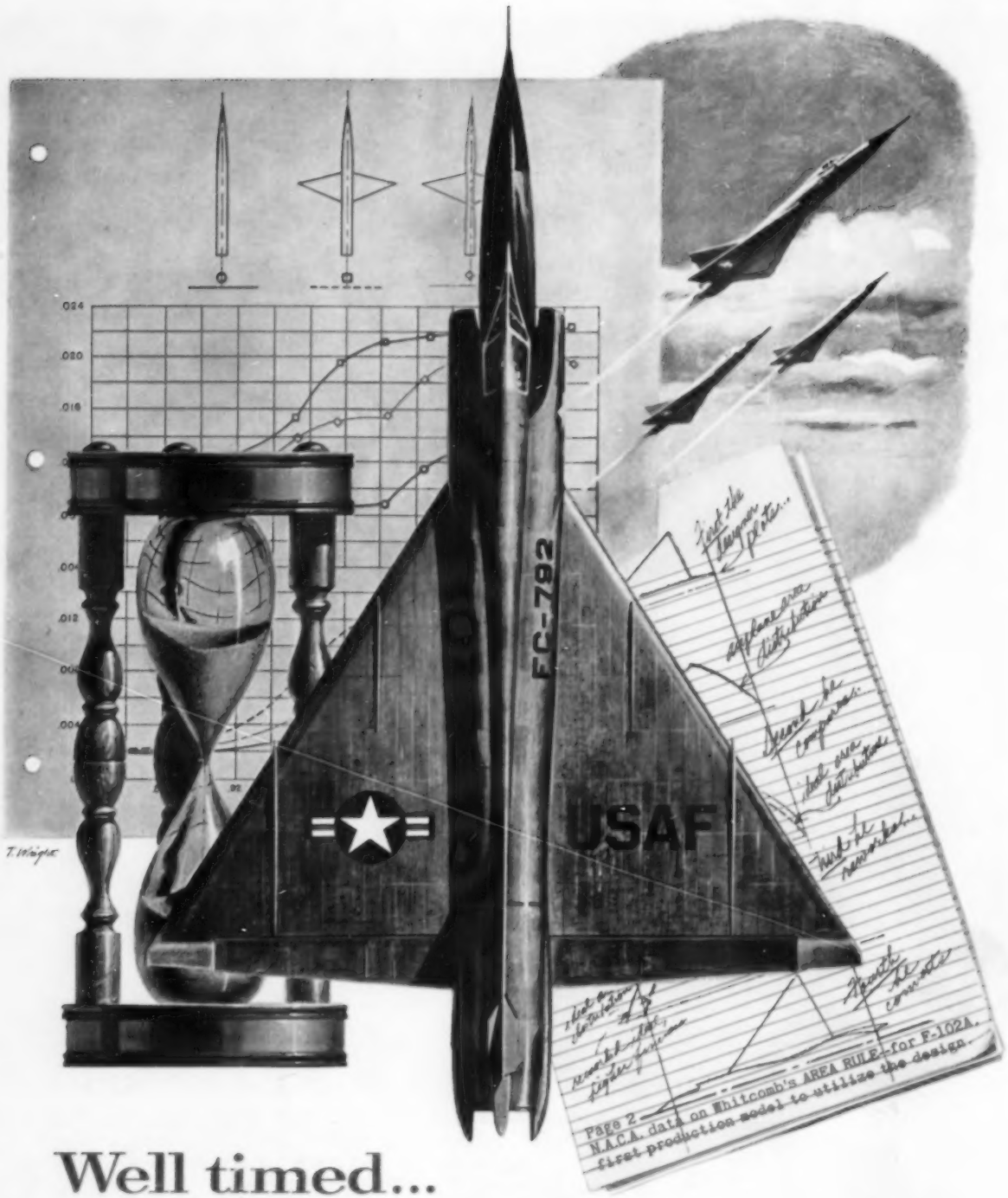

Well timed...

Research and development cut the time between *needing* and *having* Convair's supersonic F-102A all-weather interceptor. Application of the AREA RULE gave the F-102A an hour-glass shape, enabling it to attain even higher performance into the supersonic speed range!

A result of extensive design, testing and re-designing, the delta-wing F-102A is now being produced in quantity for the U.S.A.F. Air Defense Command – evidence again of Convair's *engineering to the Nth power!*

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